# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document specifies the measurement procedures for the conformance test of the user equipment (UE) that contain requirements for support of RRM (Radio Resource Management) as part of the 5G New Radio (5G-NR). The present document covers NR Range 1, NR Range 2 and Interworking.

The requirements are listed in different clauses only if the corresponding parameters deviate. More generally, tests are only applicable to those mobiles that are intended to support the appropriate functionality. To indicate the circumstances in which tests apply, this is noted in the "*test applicability*" part of the test.

For example, only Release 15 and later UE declared to support NR shall be tested for this functionality. In the event that for some tests different conditions apply for different releases, this is indicated within the text of the test itself.

# 2 References

The following documents contain provisions, which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[3] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[4] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[5] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".

[6] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[7] 3GPP TS 38.211: "NR; Physical channels and modulation".

[8] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[9] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[10] 3GPP TS 38.215: "NR; Physical layer measurements".

[11] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".

[12] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[13] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[14] 3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment".

[15] 3GPP TS 38.508-2: "5GS; User Equipment (UE) conformance specification; Part 2: Common Implementation Conformance Statement (ICS) proforma".

[16] 3GPP TS 38.509: "5GS; Special Conformance Testing Functions for UE".

[17] 3GPP TS 38.521-1: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Range 1 Standalone".

[18] 3GPP TS 38.521-2: " NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Range 2 Standalone".

[19] 3GPP TS 38.521-3: " NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[20] 3GPP TS 38.521-4: "NR; User Equipment (UE) conformance specification; Part 4: Performance".

[21] 3GPP TS 38.522: "NR; User Equipment (UE) conformance specification; Applicability of radio transmission, radio reception and radio resource management test cases".

[22] 3GPP TS 38.903: "NR; Derivation of test tolerances and measurement uncertainty for User Equipment (UE) conformance test cases".

[23] 3GPP TS 36.133: "E-UTRA requirements for support of radio resource management".

[24] 3GPP TS 36.211: "E-UTRA Physical Channels and Modulation".

[25] 3GPP TS 36.508: "Common test environments for User Equipment (UE)".

[26] 3GPP TS 36.521-3: "E-UTRA; UE conformance specification; Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing"

[27] 3GPP TS 36.101: "E-UTRA UE radio transmission and reception".

[28] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[29] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC) Protocol Specification".

[30] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode".

[31] 3GPP TS 38.212 "NR; Multiplexing and channel coding".

[32] 3GPP TR 38.810: "Study on test methods for New Radio".

[33] 3GPP TR 36.213: "E-UTRA; Physical layer procedures".

[34] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

[35] 3GPP TS 38.300: "NR; NR and NG-RAN Overall description; Stage-2".

[36] 3GPP TS 37.106: "User Equipment (UE) requirements for shared spectrum channel access".

[37] 3GPP TS 37.213: “LTE; 5G; Physical layer procedures for shared spectrum channel access”.

[38] 3GPP TS 37.355: "LTE Positioning Protocol (LPP) ".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**1 Rx RedCap: RedCap UE for which requirements are derived assuming 1 Rx branch.**

**2 Rx RedCap: RedCap UE for which requirements are derived assuming 2 Rx branches.**

**Active DL BWP:** Active DL bandwidth part as defined in 3GPP TS 38.213 [8].

**Blackbox Approach:** Testing methodology, in which the UE internal implementation of certain specific UE functionality involved in the test, is unknown.

**Control Resource Set:** As defined in 3GPP TS 38.213 [8].

**DL BWP:** DL bandwidth part as defined in 3GPP TS 38.213 [8].

**EN-DC:** E-UTRA-NR Dual Connectivity as defined in clause 4.1.2 of 3GPP TS 37.340 [34].

**en-gNB:** As defined in 3GPP TS 37.340 [34].

**FR1:** Frequency range 1 as defined in clause 5.1 of 3GPP TS 38.104 [28].

**FR2:** Frequency range 2 as defined in clause 5.1 of 3GPP TS 38.104 [28].

**gNB:** as defined in 3GPP TS 38.300 [TBD].

**Master Cell Group:** As defined in 3GPP TS 38.331 [13].

**Multi-Radio Dual Connectivity:** Dual Connectivity between E-UTRA and NR nodes, or between two NR nodes, as defined in 3GPP TS 37.340 [34].

**ng-eNB:** As defined in 3GPP TS 38.300 [35].

**NE-DC:** NR-E-UTRA Dual Connectivity as defined in clause 4.1.3.2 of 3GPP TS 37.340 [34].

**NGEN-DC:** NG-RAN E-UTRA-NR Dual Connectivity as defined in clause 4.1.3.1 of 3GPP TS 37.340 [34].

**NR-DC:** NR-NR Dual Connectivity as defined in clause 4.1.3.3 of 3GPP TS 37.340 [34].

**Primary Cell:** As defined in 3GPP TS 38.331 [13].

**Quasi Co-Location:** As defined in 3GPP TS 38.214 [9].

RedCap UE: A UE with reduced capabilities as defined in clause 4.2 in TS 38.306 [11].

**RLM-RS resource:** A resource out of the set of resources configured for RLM by higher layer parameter RLM-RS-List [2] as defined in 3GPP TS 38.213 [8].

**SA operation mode:** Operation mode when the UE is configured with at least PCell and not any MR-DC.

**Secondary Cell:** As defined in 3GPP TS 38.331 [13].

**Secondary Cell Group:** As defined in 3GPP TS 38.331 [13].

**Serving Cell:** As defined in 3GPP TS 38.331 [13].

**SMTC:** An SSB-based measurement timing configuration configured by *SSB-MeasurementTimingConfiguration* as specified in 3GPP TS 38.331 [13].

**Special Cell:** As defined in 3GPP TS 38.331 [13].

**SSB:** SS/PBCH block as defined in clause 7.8.3 of 3GPP TS 38.211 [7].

**Timing Advance Group:** As defined in 3GPP TS 38.331 [13].

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

[…] Values included in square bracket shall be considered for further studies, because it means that a decision about that value was not taken.

BWChannel Channel bandwidth, defined in TS 38.101-1 [2], 38.101-2 [3] and 38.101-3 [4] subclause 3.2

Ês Received energy per RE (power normalized to the subcarrier spacing) during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector or at the gNB reference point as defined in TS 38.215 [10], subclause 5.2 for the respective measurement type

Io The total received power density, including signal and interference, as measured at the UE antenna connector.

Ioc The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector.

Iot The received power spectral density of the total noise and interference for a certain RE (power integrated over the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector or at the gNB reference point as defined in TS 38.215 [10], subclause 5.2 for the respective measurement type

*Noc* The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector

S Cell Selection Criterion defined in TS 38.304, subclause 5.2.3.2 for NR

SSB\_RP Received (linear) average power of the resource elements that carry NR synchronisation burst, measured at the UE antenna connector

Srxlev Cell selection RX level, defined in TS 38.304, subclause 5.2.3.2

Squal Cell selection quality, defined in TS 38.304, subclause 5.2.3.2

Sintrasearch Defined in TS 38.304 [30], subclause 5.2.4.7 for E-UTRAN amd 38.304 subclause 5.2.4.7 for NR

Snonintrasearch Defined in TS 38.304 [30], subclause 5.2.4.7

Threshx, high Defined in TS 38.304 [30], subclause 5.2.4.7

Threshx, low Defined in TS 38.304 [30], subclause 5.2.4.7

Threshserving, low Defined in TS 38.304 [30], subclause 5.2.4.7

TRE-ESTABLISH-REQ The RRC Re-establishment delay requirement, the time between the moment when erroneous CRCs are applied, to when the UE starts to send preambles on the PRACH.Tc Basic time unit, defined in clause 4.1 of 3GPP TS 38.211 [7].

Ts Reference time unit, defined in clause 4.1 of 3GPP TS 38.211 [7].

TUE\_re-establish\_delay Time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [13] is detected by the UE and when the UE sends PRACH to the target PCell.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AoA Angle of Arrival

AoD Angle of Departure

BFD Beam Failure Detection

BFD-RS BFD Reference Signal

BS Base Station

BWP Bandwidth Part

CBD Candidate Beam Detection

CDF Cumulative Distribution Function

CC Component Carrier

CLI Cross Link Interference

CMR Channel Measurement Resource

CORESET Control Resource Set

CP Cyclic Prefix

CSI Channel-State Information

CSI-RS CSI Reference Signal

CSI-RSRP CSI Reference Signal based Reference Signal Received Power

CSI-RSRQ CSI Reference Signal based Reference Signal Received Quality

CSI-SINR CSI Reference Signal based Signal to Noise and Interference Ratio

DC Dual Connectivity

DCI Downlink Control Information

DL Downlink

DMRS Demodulation Reference Signal

DRX Discontinuous Reception

E-CID Enhanced Cell ID

E-UTRA Evolved UTRA

E-UTRA/5GC E-UTRA connected to 5GC

E-UTRAN Evolved UTRAN

EN-DC E-UTRA – NR Dual Connectivity

FR Frequency Range

FR1 Frequency Range 1

FR2 Frequency Range 2

HARQ Hybrid Automatic Repeat Request

HO Handover

IMR Interference Measurement Resource

L1-RSRP Layer 1 RSRP

LMF Location Management Function

LPP LTE Positioning Protocol

MAC Medium Access Control

MCG Master Cell Group

MG Measurement Gap

MGL Measurement Gap Length

MGRP Measurement Gap Repetition Period

MIB Master Information Block

MN Master Node

MR-DC Multi-Radio Dual Connectivity

NCSG Network Controlled Small Gap

NE-DC NR-E-UTRA Dual Connectivity

NGEN-DC NG-RAN E-UTRA-NR Dual Connectivity

NR New Radio

NR/5GC NR connected to 5GC

NR-DC NR-NR Dual Connectivity

NSA Non-Standalone

OCNG OFDMA Channel Noise Generator

OFDM Orthogonal Frequency Division Multiplexing

OFDMA Orthogonal Frequency Division Multiple Access

PCC Primary Component Carrier

PCell Primary Cell

PDCCH Physical Downlink Control Channel

PDSCH Physical Downlink Shared Channel

PLMN Public Land Mobile Network

PRACH Physical RACH

PRS Positioning Reference Signal

PSCell Primary Secondary Cell

PSS Primary Synchronization Signal

pTAG Primary Timing Advance Group

PUCCH Physical Uplink Control Channel

PUSCH Physical Uplink Shared Channel

QCL Quasi Co-Location

RACH Random Access Channel

RAT Radio Access Technology

RedCap Reduced Capabilities

RLM Radio Link Monitoring

RLM-RS Reference Signal for RLM

RMC Reference Measurement Channel

RMSI Remaining Minimum System Information

RRC Radio Resource Control

RRM Radio Resource Management

RSRP Reference Signal Received Power

RSRQ Reference Signal Received Quality

RSSI Received Signal Strength Indicator

RSTD Reference Signal Time Difference

RTT Round Trip Time

SA Standalone

SCC Secondary Component Carrier

SCell Secondary Cell

SCG Secondary Cell Group

SCS Subcarrier Spacing

SCSSSB SSB subcarrier spacing

SDL Supplementary Downlink

SFN System Frame Number

SFTD SFN and Frame Timing DifferenceSI System Information

SIB System Information Block

SMTC SSB-based Measurement Timing configuration

SpCell Special Cell

SRS Sounding Reference Signal

SRS-RSRP Sounding Reference Signal based Reference Signal Received Power

SS System Simulator

SS-RSRP Synchronization Signal based Reference Signal Received Power

SS-RSRQ Synchronization Signal based Reference Signal Received Quality

SS-SINR Synchronization Signal based Signal to Noise and Interference Ratio

SSB Synchronization Signal Block

SSB\_RP Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector.

SSS Secondary Synchronization Signal

sTAG Secondary Timing Advance Group

SUL Supplementary Uplink

TA Timing Advance

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TTI Transmission Time Interval

UL Uplink

VIL Visible Interruption Length

VIRP Visible Interruption Repetition Period

# 3A Requirements for the support of RRM

## 3A.1 General

### 3A.1.0 Overview of RRM requirements

Radio Resource Management (RRM) ensures the efficient use of the available radio resources and also provides mechanisms that enable NR to meet radio resource related requirements. The requirements are divided in four main clauses according to the network deployment and the frequency range:

- Clause 4 for EN-DC test cases where all NR cells are in FR1.

- Clause 5 for EN-DC test cases where at least one NR cell is in FR2.

- Clause 6 for NR/5GCtest cases where all NR cells are in FR1.

- Clause 7 for NR/5GCtest cases where at least one NR cell is in FR2.

The requirements that are tested include:

- Idle mode, the cell re-selection algorithms that are controlled by the setting of parameters (thresholds and hysteresis values) that define the best cell and/or determine when the UE should select a new cell.

Inactive mode, the cell re-selection algorithms that are controlled by the setting of parameters (thresholds and hysteresis values) that define the best cell and/or determine when the UE should select a new cell.

- The configuration of the UE measurement and reporting procedures that are transmitted via dedicated signalling in connected mode and the reporting accuracy of the required measurements.

- Connected mode, the mobility of radio connections that has to be supported.

- Handover decisions that may be based on UE or gNB measurements.

- Inter-RAT RRM, the management of radio resources in connection with inter-RAT mobility, e.g. Inter-RAT handover.

Inter frequency and inter-RAT test cases are performed without frequency overlapping between cells required in the test:

- For bands with bandwidth not accommodating all the NR cells required in the test without frequency overlapping, inter band testing shall be done according to clause 3A.5. If the UE does not support the combination given in clause 3A.5, the relevant tests are applicable only to the bands with the necessary bandwidth.

- In case when frequency overlapping occurs due to the frequency channel selection defined for the test (i.e. Cell number as per Annex D), other frequency channels which avoid the frequency overlapping shall be selected. If no suitable selection is found the test is not applicable for the affected band.

### 3A.1.1 Test coverage across 5G NR connectivity options

The test cases in this specification cover both NR/5GC (including FR1+ FR2 CA or FR1+FR2 NR-DC) as well as EN-DC and NGEN-DC testing. Below shall be the understanding with respect to coverage across 5G NR connectivity options:

1. Unless otherwise stated within the test case, it shall be understood that test requirements are agnostic of the EN-DC and NGEN-DC connectivity option configured within the test. The test coverage across the EN-DC and NGEN-DC connectivity options shall be considered fulfilled by executing the test case in one of these connectivity options.

2. EN-DC is the default connectivity option used for EN-DC and NGEN-DC test cases.

3. If a UE does not support EN-DC, NGEN-DC can be configured to execute the test. The leverage rule detailed in (1) would apply.

**Table 3A.1.1-1: Void**

**Table 3A.1.1-2: Void**

Editor’s Note: Any additional test config details needed for NE-DC and NGEN-DC are FFS.

## 3A.2 Requirements Classification for Statistical Testing

The test requirements are expressed as absolute requirements with a single value stating the requirement or expressed as a success rate. The statistical nature depends on the type of test requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a Device Under Test (DUT) passing the test actually meets the test requirement and determines how many times a test have to be repeated and what the pass and fail criteria is. The statistical significance shall be set according to Annex G.

## 3A.3 Antenna Configuration

Unless otherwise specified, NR FDD or NR TDD cells in all RRM test cases in AWGN propagation condition are configured with antenna configuration 1x2.

## 3A.4 NR band groups

### 3A.4.0 General

The intention of the band grouping defined in this clause is to increase the readability of the test specification.

The frequency bands grouping is derived based on UE REFSENS requirements specified in 3GPP TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4] and assuming 0.5 dB step between the neighbour groups. The groups are defined in the order of increasing REFSENS, i.e., the group A has the smallest REFSENS among the groups. For the same SCS and a given bandwidth, the bands within the same group have the same Io conditions in a corresponding requirement in this specification, provided the bands support this SCS. For different SCSs supported by a frequency band and the same bandwidth, different Io conditions may apply for the frequency band in the requirements, while the band group is the same, based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported SCSs for this bandwidth. For the same SCS but different supported bandwidths, the group for a band is determined based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported bandwidths.

### 3A.4.1 NR operating bands in FR1

NR frequency bands grouping for FR1 is specified in Table 3A.4.1-1.

Table 3A.4.1-1: NR frequency band groups for FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | NR FDD | | NR TDD | | NR SDL | | NR CCA10 | |
|  | Band group notation | Operating bands | Band group notation | Operating bands | Band group notation | Operating bands | Band group notation | Operating bands |
| A | NR\_FDD\_FR1\_A | n1, n18, n24, n70, n744, n91, n92, n93, n94, n100 | NR\_TDD\_FR1\_A | n34, n389, n39, n40, n50, n51, n53, n54, n101 | NR\_SDL\_FR1\_A | n67, n75, n76 | NR\_CCA\_FR1\_A | - |
| B | NR\_FDD\_FR1\_B | n65, n66, n743 | NR\_TDD\_FR1\_B | n387 | NR\_SDL\_FR1\_B | - | NR\_CCA\_FR1\_B | - |
| C | NR\_FDD\_FR1\_C | n30 | NR\_TDD\_FR1\_C | n48, n771, n78, n79 | NR\_SDL\_FR1\_C | - | NR\_CCA\_FR1\_C | - |
| D | NR\_FDD\_FR1\_D | n28 | NR\_TDD\_FR1\_D | n772 | NR\_SDL\_FR1\_D | - | NR\_CCA\_FR1\_D | - |
| E | NR\_FDD\_FR1\_E | n2, n5, n7 | NR\_TDD\_FR1\_E | n41, n90 | NR\_SDL\_FR1\_E | - | NR\_CCA\_FR1\_E | - |
| F | NR\_FDD\_FR1\_F | n266 | NR\_TDD\_FR1\_F | - | NR\_SDL\_FR1\_F | - | NR\_CCA\_FR1\_F | - |
| G | NR\_FDD\_FR1\_G | n3, n8, n12, n13, n14, n20, n71, n85, n10511 | NR\_TDD\_FR1\_G | n104 | NR\_SDL\_FR1\_G | n29 | NR\_CCA\_FR1\_G | - |
| H | NR\_FDD\_FR1\_H | n25 | NR\_TDD\_FR1\_H | - | NR\_SDL\_FR1\_H | - | NR\_CCA\_FR1\_H | - |
| I | NR\_FDD\_FR1\_I | - | NR\_TDD\_FR1\_I |  | NR\_SDL\_FR1\_I | - | NR\_CCA\_FR1\_I | n46 |
| J | NR\_FDD\_FR1\_J | - | NR\_TDD\_FR1\_J | n478 | NR\_SDL\_FR1\_J | - | NR\_CCA\_FR1\_J | n96, n102 |
| NOTE 1: Except 3.8 GHz to 4.2 GHz.  NOTE 2: Only 3.8 GHz to 4.2 GHz.  NOTE 3: Except 1475.9 MHz to 1510.9 MHz.  NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.  NOTE 5: These bands are used only in NR carrier aggregation with other NR bands according to NR CA band combinations specified in TS 38.101-1 [2] and TS 38.101-3 [4].  NOTE 6: The minimum Io condition is reduced by 0.5 dB when the carrier frequency of the assigned NR channel bandwidth is within 865-894 MHz.  NOTE 7: When this band is only used for V2X SL service, the band is exclusively used for NR V2X in particular regions.  NOTE 8: This band is unlicensed band used for V2X service. There is no expected network deployment in this band.  NOTE 9: When this band is only used for WAN service.  NOTE 10: Operating bands where operation on carrier frequencies with CCA is supported.  NOTE 11: The minimum Io condition is reduced by 0.5 dB when the downlink channel overlap the 612-617 MHz frequency range and the channel bandwidth is 5 MHz. | | | | | | | | |



Table 3A.4.1-2: Power offsets for the test configuration between NR frequency band groups for FR1 with respect to NR\_FDD\_FR1\_A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Group | NR FDD | | NR TDD | | NR SDL | |
|  | Band group notation | Power Offset [dB], ΔBG\_offset | Band group notation | Power Offset [dB], ΔBG\_offset | Band group notation | Power Offset [dB], ΔBG\_offset |
| A | NR\_FDD\_FR1\_A | - | NR\_TDD\_FR1\_A | 0.0 | NR\_SDL\_FR1\_A | 0.0 |
| B | NR\_FDD\_FR1\_B | 0.5 | NR\_TDD\_FR1\_B | 0.5 | NR\_SDL\_FR1\_B | - |
| C | NR\_FDD\_FR1\_C | 1.0 | NR\_TDD\_FR1\_C | 1.0 | NR\_SDL\_FR1\_C | - |
| D | NR\_FDD\_FR1\_D | 1.5 | NR\_TDD\_FR1\_D | 1.5 | NR\_SDL\_FR1\_D | - |
| E | NR\_FDD\_FR1\_E | 2.0 | NR\_TDD\_FR1\_E | 2.0 | NR\_SDL\_FR1\_E | - |
| F | NR\_FDD\_FR1\_F | 2.5 | NR\_TDD\_FR1\_F | 2.5 | NR\_SDL\_FR1\_F | - |
| G | NR\_FDD\_FR1\_G | 3.0 | NR\_TDD\_FR1\_G | 3.0 | NR\_SDL\_FR1\_G | - |
| H | NR\_FDD\_FR1\_H | 3.5 | NR\_TDD\_FR1\_H | 3.5 | NR\_SDL\_FR1\_H | - |
| J | NR\_FDD\_FR1\_J | 4.5 | NR\_TDD\_FR1\_J | 4.5 | NR\_SDL\_FR1\_J | - |
| NOTE: In the test parameters table, only the power configuration for NR\_FDD\_FR1\_A or NR\_TDD\_FR1\_A will be given. | | | | | | |

Table 3A.4.1-2A: Power offsets for the test configuration between NR frequency band groups for FR1 shared spectrum channel access with respect to NR\_TDD\_FR1\_A

|  |  |  |
| --- | --- | --- |
| Group | NR-U | |
|  | Band group notation | Power Offset [dB], ΔBG\_offset |
| H | NR\_CCA\_FR1\_I | 4.0 |
| J | NR\_CCA\_FR1\_J | 4.5 |
| NOTE: In the test parameters table, the power configuration for NR\_CCA\_FR1\_I and/or NR\_TDD\_FR1\_J will be given. | | |

### 3A.4.2 NR operating bands in FR2

NR frequency bands grouping for FR2 is specified in Table 3A.4.2-1.

Table 3A.4.2-1: NR frequency band groups for FR2

|  |  |  |
| --- | --- | --- |
| Group | Band group notation | Operating bands |
| A | NR\_TDD\_FR2\_A | n2571, n2581, n2611 |
| B | NR\_TDD\_FR2\_B | n2574, n2584, n2614 |
| C | NR\_TDD\_FR2\_C |  |
| D | NR\_TDD\_FR2\_D |  |
| E | NR\_TDD\_FR2\_E |  |
| F | NR\_TDD\_FR2\_F | n2604 |
| G | NR\_TDD\_FR2\_G | n2601 |
| H | NR\_TDD\_FR2\_H |  |
| I | NR\_TDD\_FR2\_I |  |
| J | NR\_TDD\_FR2\_J |  |
| K | NR\_TDD\_FR2\_K |  |
| L | NR\_TDD\_FR2\_L | n2572, n2582, n2612 |
| M | NR\_TDD\_FR2\_M |  |
| N | NR\_TDD\_FR2\_N |  |
| O | NR\_TDD\_FR2\_O |  |
| P | NR\_TDD\_FR2\_P |  |
| Q | NR\_TDD\_FR2\_Q |  |
| R | NR\_TDD\_FR2\_R |  |
| S | NR\_TDD\_FR2\_S |  |
| T | NR\_TDD\_FR2\_T | n2573, n2583, n2613 |
| U | NR\_TDD\_FR2\_U |  |
| V | NR\_TDD\_FR2\_V |  |
| W | NR\_TDD\_FR2\_W |  |
| X | NR\_TDD\_FR2\_X |  |
| Y | NR\_TDD\_FR2\_Y | n2603 |
| Z | NR\_TDD\_FR2\_Y |  |
| AA | NR\_TDD\_FR2\_AA | n2593 |
| NOTE 1: UE power class 1.  NOTE 2: UE power class 2.  NOTE 3: UE power class 3.  NOTE 4: UE power class 4. | | |

Table 3A.4.2-2: FFS

## 3A.5 NR operating band configuration

The additional band defined in Table 3A.5-1 shall be used for RRM inter-frequency tests where the band under test cannot accommodate two (or more) non-overlapping inter-frequency cells. The usage of the additional band is conditioned to the UE supporting this band, the corresponding channel bandwidth and other band-dependent parameters. If the UE does not support the additional band or associated parameters, the inter-frequency test shall be considered Not Applicable for the band under test.

Inter-band configuration is not affecting the Test purpose since the minimum requirements are valid regardless of band. Band combinations defined in table 3A.5-1 shall be used for testing.

Table 3A.5-1: Inter-band configuration

|  |  |
| --- | --- |
| Band under test | Additional band (s) |
| n12 | n66 |
| n14 | n66 |
| n18 | n1 |
| n30 | n66 |
| n34 | n41 |
| n38 | n41 |
| n39 | n41 |
| n53 | n41 |
| n70 | n66 |
| NOTE 1: The band under test should contain the inter-frequency (neighbour) cell.  NOTE 2: The additional band should contain the serving cell of the test. If more than one inter-frequency cell is needed, that cell should be on the additional band.  NOTE 3: The bands and cells referred in this table are NR bands and cells only. For instructions on how to configure the E-UTRA operating band please refer to 3GPP TS 36.521-3 [26].  NOTE 4: The additional bands in this table are to be used in NR SA test cases only. EN-DC test cases cannot make use of additional bands. | |

## 3A.6 UE with Multiband Capability

The Radio Resource Management performance of a UE in all sections except 4.7, 5.7, 6.7, 7.7 and 8.5.2 is independent from all bands. Therefore, the required performance in the respective test cases can be verified in one of the bands supported by the UE, except for inter-band testing requirements in clause 3A.1.

The NR standalone test cases in sections 6.7 and 7.7 are dependent on the NR band of the target cell, and is required to be verified in all UE supported NR bands.

The EN-DC test cases in sections 4.7, 5.7 and inter-RAT test cases in clause 8.5.2 are dependent on the NR band of the target cell, and is required to be verified in all UE supported NR bands. It is not necessary to repeat the tests for different LTE bands. For EN-DC configurations with the same NR band, it is sufficient to configure any one of them to execute the tests.

# 4 EN-DC with all NR cells in FR1

## 4.0 General

This clause contains test scenarios for E-UTRA and NR dual connectivity with E-UTRA as PCell and NR and PSCell. All NR cells are in Frequency Range 1.

## 4.1 Void

## 4.2 Void

## 4.3 RRC\_CONNECTED state mobility

### 4.3.1 Void

### 4.3.2 RRC connection mobility control

#### 4.3.2.1 Void

#### 4.3.2.2 Random access

##### 4.3.2.2.1 EN-DC FR1 contention based random access

4.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

4.3.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.3.2.2.1.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2 and A.4.3.2.2.1.

4.3.2.2.1.4 Test description

4.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.1.4.1-1.

Table 4.3.2.2.1.4.1-1: Contention based random access test in FR1  
for PSCell in EN-DC supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 4.3.2.2.1-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.1-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.1-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.1-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.1.4.1-2.

Table 4.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.3.2.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.1.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4.3.2.2.1.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC\_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.3.2.2.1.5-1.

3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting Random Access Preamble:

4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response:

5.1. Repeat steps 1-3.

5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission:

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3 including C-RNTI MAC control element.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving a successful UE Contention Resolution:

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

8.4. The System Simulator shall send a PDCCH addressed to the C-RNTI.

8.5. The UE shall send PUSCH according to the received PDCCH addressed to the C-RNTI.

9. Test 7: Correct behaviour when contention Resolution timer expires:

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

9.4. The System Simulator shall not send a PDCCH addressing the C-RNTI.

9.5. As there was no PDCCH addressing the C-RNTI, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

9.6. Measure the power and timing of the first preamble after the Contention Resolution Timer and backoff timer expire and it shall not exceed the values specified in clause 4.3.2.2.1.5.

4.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.3.2.2.1.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0  Table 4.6.3-120 with SSB-Index 0 |

Table 4.3.2.2.1.4.3-1: RACH-ConfigCommon for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigCommon::= SEQUENCE { |  |  |  |
| rach-ConfigGeneric | RACH-ConfigGeneric |  |  |
| totalNumberOfRA-Preambles | 48 |  |  |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { |  |  |  |
| oneFourth | n48 |  | FR1 |
| } |  |  |  |
| groupBconfigured SEQUENCE { |  |  |  |
| numberOfRA-PreamblesGroupA | 48 |  |  |
| } |  |  |  |
| ra-ContentionResolutionTimer | sf48 |  |  |
| rsrp-ThresholdSSB | RSRP\_51 |  |  |
| prach-RootSequenceIndex CHOICE { |  |  |  |
| l139 | 0 |  |  |
| } |  |  |  |
| msg1-SubcarrierSpacing | kHz 15 |  | 15 kHz |
|  | kHz 30 |  | 30 kHz |
| } |  |  |  |

Table 4.3.2.2.1.4.3-2: RACH-ConfigGeneric for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 102 |  | FR1 |
| msg1-FDM | one |  | FR1 |
| zeroCorrelationZoneConfig | 11 |  |  |
| preambleReceivedTargetPower | -120 |  |  |
| preambleTransMax | n6 |  |  |
| powerRampingStep | dB2 |  |  |
| ra-ResponseWindow | sl10 |  |  |
| } |  |  |  |

Table 4.3.2.2.1.4.3-3: *ServingCellConfigCommon* for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 7.3.1-4 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { |  |  |  |
| ss-PBCH-BlockPower | -5 |  |  |
| } |  |  |  |

4.3.2.2.1.5 Test requirement

Table 4.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for PSCell in EN-DC. Tables 4.3.2.2.1.5-2, 4.3.2.2.1.5-3 and 4.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 4.3.2.2.1.5-1: General test parameters for contention based random access test  
in FR1 for PSCell in EN-DC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test-1 | Comments |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 | As defined in clause A.3.1 |
| Config 3,4 | SSB.4 FR1 |
| Duplex Mode for Cell 2 | | Config 1,2 |  | FDD |  |
| Config 3,4 | TDD |
| TDD Configuration | | Config 3,4 |  | TDDConf.2.1 |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | As defined in clause A.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 |  | SR1.1 FDD | As defined in clause A.1.1. |
| Config 3,4 | SR.2.1 TDD |
| RMSI CORESET reference channel | | Config 1,2 |  | CR.1.1 FDD |  |
| Config 3,4 |  | CR.2.1 TDD |  |
| Dedicated CORESET reference channel | | Config 1,2 |  | CCR.1.1 FDD |  |
| Config 3,4 |  | CCR.2.1 TDD |  |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | 3 |
| SS-RSRP | Config 1,2 | dBm / 15kHz | -95 |
| Config 3,4 | -98 |
| SS-RSRP | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | -17 |
| SS-RSRP | Config 1,2 | dBm / 15kHz | -115 |
| Config 3,4 | -118 |
| SS-RSRP | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 3,4 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | |  | PRACH.1 FR1 | As defined in clause A.7.1. |
| Propagation Condition | | | - | AWGN |  |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  NOTE 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters.  NOTE 3: Void.  NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting Random Access Preamble:

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.1.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.1.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission:

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving a successful UE Contention Resolution:

- The UE shall send PUSCH according to the PDCCH addressed to the C-RNTI.

Test 7: Correct behaviour when contention resolution timer expires:

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Table 4.3.2.2.1.5-2: Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 11.1 dB |

Table 4.3.2.2.1.5-3: Relative power tolerance Test requirements

|  |  |
| --- | --- |
| **Power step P (Up or down)**  **(dB)** | **PRACH (dB)** |
| 2 ≤ ΔP < 3 | ±3.2 |

Table 4.3.2.2.1.5-4: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals s(KHz)** | **Te** |
| 1 | 15 | 15 | 880\*Tc |
| 30 | 30 | 624\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

##### 4.3.2.2.2 EN-DC FR1 non-contention based random access

4.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

4.3.2.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

4.3.2.2.2.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamblewith the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2 and A.4.3.2.2.2. Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

4.3.2.2.2.4 Test description

4.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.2.4.1-1.

Table 4.3.2.2.2.4.1-1: Non-contention based random access test  
in FR1 for PSCell in EN-DC supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 4.3.2.2.2-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.2-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.2-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.2-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.2.4.1-2.

Table 4.3.2.2.2.4.1-2: Initial conditions for Non-contention based random access test in FR1 for EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.3.2.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.2.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4.3.2.2.2.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC , DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to Table 4.3.2.2.2.5-1.

3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to the Tables for Non-Contention Random Access in clause 4.3.2.2.2.4.3.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble:

4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble:

5.1. Set the parameters according to Table 4.3.2.2.2.5-1 Subtest 2.

5.2. Repeat steps 1-3.

5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response:

7.1. Repeat steps 1-3.

7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.2.5.

4.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 with the following exceptions.

Table 4.3.2.2.2.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0  Table 4.6.3-120 with SSB-Index 0 |

Table 4.3.2.2.2.4.3-1: RACH-ConfigCommon for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigCommon::= SEQUENCE { |  |  |  |
| rach-ConfigGeneric | RACH-ConfigGeneric |  |  |
| totalNumberOfRA-Preambles | 48 |  |  |
| groupBconfigured SEQUENCE { |  |  |  |
| numberOfRA-PreamblesGroupA | 48 |  |  |
| } |  |  |  |
| rsrp-ThresholdSSB | RSRP\_51 |  | Subtest 1 |
| prach-RootSequenceIndex CHOICE { |  |  |  |
| l139 | 0 |  |  |
| } |  |  |  |
| msg1-SubcarrierSpacing | kHz 15 |  | 15kHz |
|  | kHz 30 |  | 30kHz |
| } |  |  |  |

Table 4.3.2.2.2.4.3-2: RACH-ConfigDedicated for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigDedicated::= SEQUENCE { |  |  |  |
| cfra SEQUENCE { |  |  |  |
| occasions SEQUENCE { |  |  |  |
| ssb-perRACH-Occasion | oneFourth |  |  |
| } |  |  |  |
| resources CHOICE { |  |  |  |
| ssb SEQUENCE { |  |  |  |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry |  |  |
| ssb[1] | 0 |  |  |
| ra-PreambleIndex[1] | 50 |  | Subtest 1 |
| } |  |  |  |
| ra-ssb-OccasionMaskIndex | 1 |  | Subtest 1 |
| } |  |  |  |
| csirs SEQUENCE { |  |  |  |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF { |  |  |  |
| ra-OccasionList | 1 |  | Subtest 2 |
| ra-PreambleIndex[1] | 50 |  | Subtest 2 |
| } |  |  |  |
| rsrp-ThresholdCSI-RS | RSRP\_51 |  | Subtest 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.3.2.2.2.4.3-3: RACH-ConfigGeneric for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 102 |  |  |
| msg1-FDM | one |  |  |
| zeroCorrelationZoneConfig | 11 |  |  |
| preambleReceivedTargetPower | -120 |  |  |
| preambleTransMax | n6 |  |  |
| powerRampingStep | dB2 |  |  |
| ra-ResponseWindow | sl10 |  |  |
| } |  |  |  |

Table 4.3.2.2.2.4.3-4: *ServingCellConfigCommon* for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { |  |  |  |
| ss-PBCH-BlockPower | -5 |  |  |
| } |  |  |  |

Table 4.3.2.2.2.4.3-5: CellGroupConfig for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 with Condition CFRA | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex |  |  |
| reconfigurationWithSync SEQUENCE { |  |  |  |
| newUE-Identity | 1 |  |  |
| } |  |  |  |
| spCellConfigDedicated SEQUENCE { |  |  |  |
| uplinkConfig SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { |  |  |  |
| srs-Config | SRS-Config |  |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | BWP-Id |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.3.2.2.2.5 Test requirement

Table 4.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for PSCell in EN-DC. Tables 4.3.2.2.2.5-2, 4.3.2.2.2.5-3 and 4.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 4.3.2.2.2.5-1: General test parameters for non-contention  
based random access test in FR1 for PSCell in EN-DC

| Parameter | | | Unit | Test-1 | **Test-2** | **Comments** |
| --- | --- | --- | --- | --- | --- | --- |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 | SSB.3 FR1 | As defined in clause A.3.1 |
| Config 3,4 | SSB.4 FR1 | SSB.4 FR1 |
| CSI-RS Configuration | | Config 1,2 |  | N/A | CSI-RS.1.1 FDD | As defined in clause A.1.4 |
| Config 3,4 | CSI-RS.2.1 TDD |
| Duplex Mode for Cell 2 | | Config 1,2 |  | FDD | FDD |  |
| Config 3,4 | TDD | TDD |
| TDD Configuration | | Config 3,4 |  | TDDConf.2.1 | TDDConf.2.1 |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | OCNG pattern 1 | As defined in clause A.2.1 |
| PDSCH parameters Note 4 | | Config 1,2 |  | SR1.1 FDD | SR1.1 FDD | As defined in clause A.1.1 |
| Config 3,4 | SR2.1 TDD | SR2.1 TDD |
| RMSI CORESET reference channel | | Config 1,2 |  | CR.1.1 FDD | CR.1.1 FDD |  |
| Config 3,4 |  | CR.2.1 TDD | CR.2.1 TDD |  |
| Dedicated CORESET reference channel | | Config 1,2 |  | CCR.1.1 FDD | CCR.1.1 FDD |  |
| Config 3,4 |  | CCR.2.1 TDD | CCR.2.1 TDD |  |
| NR RF Channel Number | | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 | -98 |
| Config 3,4 | -101 | -101 |
|  | | dB | 3 | 3 |
| SS-RSRP Note 3 | Config 1,2 | dBm/15kHz | -95 | -95 |
| Config 3,4 | -98 | -98 |
| SS-RSRP Note 3 | | dBm/ SCS | -95 | -95 |
| SSB with index 1 |  | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 | -98 |
| Config 3,4 | -101 | -101 |
|  | | dB | -17 | -17 |
| SS-RSRP Note 3 | Config 1,2 | dBm/15kHz | -115 | -115 |
| Config 3,4 | -118 | -118 |
| SS-RSRP Note 3 | | dBm/ SCS | -115 | -115 |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 3,4 | -62.2/38.16MHz | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [13] |
| Configured UE transmitted power () | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2] |
| PRACH Configuration | | |  | PRACH.2 FR1 | PRACH.3 FR1 | As defined in clause A.7.1 |
| Propagation Condition | | | - | AWGN | AWGN |  |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  NOTE 2: Es/Iot, SS-RSRP and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  NOTE 3: Void.  NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | | |

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble:

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.

- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble:

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.

- the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.2.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.2.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.2.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.2.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.2.5-4.

Table 4.3.2.2.2.5-2: Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| **Conditions** | **Tolerance** |
| Normal | ± 11.1 dB |

Table 4.3.2.2.2.5-3: Relative power tolerance Test requirements

|  |  |
| --- | --- |
| **Power step P (Up or down) (dB)** | **PRACH (dB)** |
| 2 ≤ ΔP < 3 | ± 3.2 |

Table 4.3.2.2.2.5-4: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals s(KHz)** | **Te** |
| 1 | 15 | 15 | 880\*Tc |
| 30 | 30 | 624\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [7]. | | | |

##### 4.3.2.2.3 EN-DC FR1 2-step contention based random access

4.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

4.3.2.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC.

4.3.2.2.3.3 Minimum conformance requirement

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [3] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2] for frequency range 1 and clause 6.3.4.3 of TS38.101-2 [3] for frequency range 2.

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [12]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [12].

The requirements in this clause apply for UE in SA operation mode or any MR-DC operation mode.

4.3.2.2.3.3.1 Correct behaviour when transmitting MsgA

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, the UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2a in TS 38.321 [7].

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, UE shall have the capability to transmit MsgA PRACH on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured.

The PRACH preamble and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [7].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [3].

4.3.2.2.3.3.2 Correct behaviour when receiving MsgB

The UE shall stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

The UE shall send ACK if Success RAR is received in MsgB and the Contention Resolution is successful, as defined in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH and monitor contention resolution as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

4.3.2.2.3.3.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.3 and A.4.3.2.2.3.

4.3.2.2.3.4 Test description

4.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.3.4.1-1.

Table 4.3.2.2.3.4.1-1: Contention based random access test  
in FR1 for PSCell in EN-DC supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 4.3.2.2.3-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.3-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.3-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.3-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.3.4.1-2.

Table 4.3.2.2.3.4.1-2: Initial conditions for Contention based random access test in FR1 for EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.3.2.2.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.3.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4.3.2.2.3.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink:

1. Ensure the UE is in state E-UTRA RRC\_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.3.2.2.3.5-1.

3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting MsgA:

4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SSB\_RP above the configured rsrp-ThresholdSSB.

4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

5.1. Repeat steps 1-3.

5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.3.5.

4.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.3.2.2.3.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0  Table 4.6.3-120 with SSB-Index 0 |

4.3.2.2.3.5 Test requirement

Table 4.3.2.2.3.5-1 defines the primary level settings for contention based random access test in FR1 for PSCell in EN‑DC.

Table 4.3.2.2.3.5-1: General test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test-1 | Comments |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 | As defined in clause A.3.1 |
| Config 3,4 | SSB.4 FR1 |
| Duplex Mode for Cell 2 | | Config 1,2 |  | FDD |  |
| Config 3,4 | TDD |
| TDD Configuration | | Config 3,4 |  | TDDConf.2.1 |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | As defined in clause A.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 |  | SR1.1 FDD | As defined in clause A.1.1. |
| Config 3,4 | SR.2.1 TDD |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | 3 |
| SS-RSRP | Config 1,2 | dBm / 15kHz | -95 |
| Config 3,4 | -98 |
| SS-RSRP | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | -17 |
| SS-RSRP | Config 1,2 | dBm / 15kHz | -115 |
| Config 3,4 | -118 |
| SS-RSRP | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36 MHz | For symbols without SSB index 1 |
| Config 3,4 | -62.2/38.16 MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | |  | FR1 MsgA configuration 1 |  |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN |  |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  NOTE 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  NOTE 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.3.5-3.

- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.3.5-3.

- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Table 4.3.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 11.1 dB |

Table 4.3.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 11.1 dB |

Table 4.3.2.2.3.5-3: Relative power tolerance Test requirements

|  |  |
| --- | --- |
| **Power step P (Up or down)**  **(dB)** | **MsgA PRACH (dB)** |
| 2 ≤ ΔP < 3 | ± 3.2 dB |

Table 4.3.2.2.3.5-4: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals s(KHz)** | **Te** |
| 1 | 15 | 15 | 880\*Tc |
| 30 | 30 | 624\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

##### 4.3.2.2.4 EN-DC FR1 2-step non-contention based random access

4.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step non-contention based random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

4.3.2.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC.

4.3.2.2.4.3 Minimum conformance requirement

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [3] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2] for frequency range 1 and clause 6.3.4.3 of TS38.101-2 [3] for frequency range 2.

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [12]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [12].

The requirements in this clause apply for UE in SA operation mode or any MR-DC operation mode.

4.3.2.2.4.3.1 Correct behaviour when transmitting MsgA

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

4.3.2.2.4.3.2 Correct behaviour when receiving MsgB

The UE may stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamblewith the calculated MsgA PRACH and MsgA PUSCH transmission power if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

4.3.2.2.4.3.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power, if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA* and the Random Access Response Reception has not been considered as successful as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.3 and A.4.3.2.2.4.

4.3.2.2.4.4 Test description

4.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.4.4.1-1.

Table 4.3.2.2.4.4.1-1: Non-contention based random access test  
in FR1 for PSCell in EN-DC supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 4.3.2.2.4-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.4-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.4-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.4-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.4.4.1-2.

Table 4.3.2.2.4.4.1-2: Initial conditions for non-contention based random access test in FR1 for EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.3.2.2.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.4.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4.3.2.2.4.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC\_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.3.2.2.4.5-1.

3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting MsgA:

4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

5.1. Repeat steps 1-3.

5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.4.5.

4.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.3.2.2.4.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0  Table 4.6.3-120 with SSB-Index 0 |

4.3.2.2.4.5 Test requirement

Table 4.3.2.2.4.5-1 defines the primary level settings for non-contention based random access test in FR1 for PSCell in EN-DC.

Table 4.3.2.2.4.5-1: General test parameters

| Parameter | | | Unit | Test-1 | Comments |
| --- | --- | --- | --- | --- | --- |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 | As defined in clause A.3.1 |
| Config 3,4 | SSB.4 FR1 |
| Duplex Mode for Cell 2 | | Config 1,2 |  | FDD |  |
| Config 3,4 | TDD |
| TDD Configuration | | Config 3,4 |  | TDDConf.2.1 |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | As defined in clause A.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 |  | SR1.1 FDD | As defined in clause A.1.1. |
| Config 3,4 | SR.2.1 TDD |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | 3 |
| SS-RSRP | Config 1,2 | dBm / 15kHz | -95 |
| Config 3,4 | -98 |
| SS-RSRP | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | -17 |
| SS-RSRP | Config 1,2 | dBm / 15kHz | -115 |
| Config 3,4 | -118 |
| SS-RSRP | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 3,4 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | |  | FR1 MsgA configuration 2 |  |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN |  |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  NOTE 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  NOTE 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.

- The MsgA shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.

- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.4.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.4.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.4.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.4.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Table 4.3.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 11.1 dB |

Table 4.3.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 11.1 dB |

Table 4.3.2.2.4.5-3: Relative power tolerance Test requirements

|  |  |
| --- | --- |
| **Power step P (Up or down)**  **(dB)** | **MsgA PRACH (dB)** |
| 2 ≤ ΔP < 3 | ± 3.2 dB |

Table 4.3.2.2.4.5-4: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals s(KHz)** | **Te** |
| 1 | 15 | 15 | 880\*Tc |
| 30 | 30 | 624\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

#### 4.3.2.3 Void

## 4.4 Timing

### 4.4.1 UE transmit timing

#### 4.4.1.0 Minimum conformance requirements

##### 4.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 4.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. *N*TA for PRACH is defined as 0.

 (in *Tc* units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. *N*TA for other channels is not changed until next timing advance is received. The value ofdepends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). is defined in Table 4.4.1.0.1-2.

Table 4.4.1.0.1-1: Te Timing Error Limit

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (KHz)** | **SCS of uplink signals s(KHz)** | **Te** |
| 1 | 15 | 15 | 12\*64\*Tc |
| 30 | 10\*64\*Tc |
| 60 | 10\*64\*Tc |
| 30 | 15 | 8\*64\*Tc |
| 30 | 8\*64\*Tc |
| 60 | 7\*64\*Tc |
| 2 | 120 | 60 | 3.5\*64\*Tc |
| 120 | 3.5\*64\*Tc |
| 240 | 60 | 3\*64\*Tc |
| 120 | 3\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6]. | | | |

Table 4.4.1.0.1-2: The Value of 

|  |  |
| --- | --- |
| Frequency range and band of cell used for uplink transmission | (Unit: TC) |
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| NOTE 1: The UE identifies  based on the information n-TimingAdvanceOffset according to TS 38.101-1 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of  is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.101-2 [3] and the value 39936 of  can also be provided for a FDD serving cell.  NOTE 2: Void | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds ±Te, the UE is required to adjust its timing to within ±Te. The reference timing shall be  before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be Tq.

2) The minimum aggregate adjustment rate shall be Tp per second.

3) The maximum aggregate adjustment rate shall be Tq per 200ms.

where the maximum autonomous time adjustment step Tq and the aggregate adjustment rate Tp are specified in Table 4.4.1.0.1-3.

Table 4.4.1.0.1-3: Tq Maximum Autonomous Time Adjustment Step and  
Tp Minimum Aggregate Adjustment rate

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of uplink signals (KHz)** | **Tq** | **Tp** |
| 1 | 15 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 30 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 60 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 2 | 60 | 2.5\*64\*Tc | 2.5\*64\*Tc |
| 120 | 2.5\*64\*Tc | 2.5\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6]. | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

#### 4.4.1.1 EN-DC FR1 UE transmit timing accuracy

4.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits.

4.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

4.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.4.4.1.1.

4.4.1.1.4 Test Description

4.4.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 4.4.1.1.4.1-1.

Table 4.4.1.1.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.4.1.1-1 | LTE FDD, NR FDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-2 | LTE FDD, NR TDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-3 | LTE FDD, NR TDD, SSB SCS 30 KHz, data SCS 30 KHz, BW 40 MHz |
| 4.4.1.1-4 | LTE TDD, NR FDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-5 | LTE TDD, NR TDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-6 | LTE TDD, NR TDD, SSB SCS 30 KHz, data SCS 30 KHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 4.4.1.1.4.1-2

Table 4.4.1.1.4.1-2: Initial conditions for EN-DC FR1 transmit timing accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 6 4.4.1.1.4.3.

2. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The power levels and settings for Cell 1 are set according to clause A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause  C.1.3, and the downlink signal levels as per clause C.1.2.

3. Downlink signals for NR cell are initially set up according to clause C.1.

4.4.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). The downlink timing of the PSCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Set up E-UTRA PCell according to parameters given in Table A.6.1.1-1 and setup NR PSCell according to parameters given in Table 4.4.1.1.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 4.4.1.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmisisons and verify that, for each received SRS, the timing of the NR cell is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB:

a. The NTA offset value (in Tc units) is 25600 for FR1.

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 4.4.1.1.5‑4.

6. The test system shall adjust the timing of the DL path by values given in Table 4.4.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

Table 4.4.1.1.4.2-1: Adjustment Value for DL Timing

|  |  |  |
| --- | --- | --- |
| SCS of SSB signals (KHz) | Adjustment Value | |
|  | Test1 | Test2 |
| 15 | +64\*64Tc | +32\*64Tc |
| 30 | +32\*64Tc | +16\*64Tc |

7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 4.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size Tq between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 4.4.1.0.1 and Table 4.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 4.4.1.0.1 and Table 4.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 4.4.1.0.1 and Table 4.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms - offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 4.4.1.0.1 and Table 4.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL\_timing\_change[Ts]/5.5Ts and DL\_timing\_change is specified in Table 4.4.1.1.4.2-1.

8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

4.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.4.1.1.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

Table 4.4.1.1.4.3-1: *SRS-Config* : Additional test requirement  
for UE transmit timing accuracy for EN-DC FR1 UE

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SRS-Config ::= SEQUENCE { |  |  |  |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { |  |  |  |
| SRS-ResourceSet[1] SEQUENCE { |  | entry 1 |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { |  |  |  |
| SRS-Resource[1] SEQUENCE { |  | entry 1 |  |
| freqHopping SEQUENCE { |  |  |  |
| c-SRS | 14 |  | SCS15 |
| 25 |  | SCS30 |
| } |  |  |  |
| groupOrSequenceHopping | neither |  |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| periodicityAndOffset-p CHOICE { |  |  |  |
| sl1 | 0 |  | Test 1 |
| sl320 | 3 |  | Test 2 and SCS15 |
| sl640 | 5 |  | Test 2 and SCS30 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.4.1.1.4.3-2: *DRX-Config* : Additional test requirement  
for UE transmit timing accuracy Test 2 for EN-DC FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| DRX-Config ::= CHOICE { |  |  |  |
| drx-onDurationTimer CHOICE { |  |  |  |
| milliSeconds | ms6 |  |  |
| } |  |  |  |
| drx-InactivityTimer | ms1 |  |  |
| drx-HARQ-RTT-TimerDL | 56 |  |  |
| drx-HARQ-RTT-TimerUL | 56 |  |  |
| drx-RetransmissionTimerDL | sl1 |  |  |
| drx-RetransmissionTimerUL | sl1 |  |  |
| drx-LongCycleStartOffset CHOICE { |  |  |  |
| ms320 | 0 |  |  |
| } |  |  |  |
| shortDRX |  | NOT PRESENT |  |
| } |  |  |  |

4.4.1.1.5 Test Requirements

Table 4.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

| Parameter | Unit | Config | Test1 | | | Test2 | | Band Group |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SSB ARFCN |  | 1,2,3,4,5,6 | Freq1 | | | Freq1 | |  |
| Duplex Mode |  | 1,4 | FDD | | | | |  |
| 2,3,5,6 | TDD | | | | |  |
| TDD configuration |  | 1,4 | Not Applicable | | | | |  |
| 2,5 | TDDConf.1.1 | | | | |
| 3,6 | TDDConf.2.1 | | | | |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 | | | | |  |
| 2,5 | 10: NRB,c = 52 | | | | |
| 3,6 | 40: NRB,c = 106 | | | | |
| Initial BWP Configuration |  | 1,2,3,4,5,6 | DLBWP.0.1  ULBWP.0.1 | | | | |  |
| Dedicated BWP Configuration |  | 1,2,3,4,5,6 | DLBWP.1.1  ULBWP.1.1 | | | | |  |
| DRx Cycle | ms | 1,2,3,4,5,6 | N/A | | | DRX.8Note5 |  | |
| PDSCH Reference measurement channel |  | 1,4 | SR.1.1 FDD | | | |  | |
| 2,5 | SR.1.1 TDD | | | |
| 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel |  | 1,4 | CR.1.1 FDD | | | |  | |
| 2,5 | CR.1.1 TDD | | | |
| 3,6 | CR.2.1 TDD | | | |
| Dedicated CORESET Reference Channel |  | 1,4 | CCR.1.1 FDD | | | |  | |
| 2,5 | CCR.1.1 TDD | | | |
| 3,6 | CCR.2.1 TDD | | | |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 | | | |  | |
| SSB configuration |  | 1,4 | SSB.1 FR1 | | | |  | |
|  | 2,5 | SSB.1 FR1 | | | |  | |
|  | 3,6 | SSB.2 FR1 | | | |  | |
| SMTC configuration |  | 1,2,3,4,5,6 | SMTC.2 | | | |  | |
| TRS configuration |  | 1,4 | TRS.1.1 FDD | | | |  | |
|  | 2,5 | TRS.1.1 TDD | | | |  | |
|  | 3,6 | TRS.1.2 TDD | | | |  | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2,4,5 | 15 | | | |  | |
| 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | | 0 | |  | |
| EPRE ratio of PBCH DMRS to SSS |  | |
| EPRE ratio of PBCH to PBCH DMRS |  | |
| EPRE ratio of PDCCH DMRS to SSS |  | |
| EPRE ratio of PDCCH to PDCCH DMRS |  | |
| EPRE ratio of PDSCH DMRS to SSS |  | |
| EPRE ratio of PDSCH to PDSCH |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  | |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -98 | | -98 | |  | |
| Note2 | dBm/SCS | 1,2,4,5 | -98 | | -98 | |  | |
| 3,6 | -95 | | -95 | |
|  |  | 1,2,3,4,5,6 | 3.3 | | 3.3 | |  | |
|  |  | 1,2,3,4,5,6 | 3.3 | | 3.3 | |  | |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -95 | | -95 | |  | |
| 3,6 | -92 | | -92 | |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | -65.08 | | -65.08 | |  | |
| dBm/38.1MHz | 3,6 | -61.99 | | -61.99 | |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN | | | |  | |
| SRS Config |  | 1,2,4,5 | SRSConf.1Note6 | SRSConf.3Note6 | | |  | |
|  | 3, 6 | SRSConf.1Note6 | SRSConf.2Note6 | | |  | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: DRx related parameters are given in Table 4.4.1.1.5-3.  NOTE 6: SRS configs are given in Table 4.4.1.1.5-2. | | | | | | | | |

Table 4.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | SRSConf.3 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 |  |
| srs-ResourceIdList | 0 | 0 | 0 |  |
| resourceType | Periodic | Periodic | Periodic |  |
| Usage | Codebook | Codebook | Codebook |  |
| SRS-ResourceSetId | 0 | 0 | 0 |  |
| SRS-Resource | nrofSRS-Ports | Port1 | Port1 | Port1 |  |
| transmissionComb | n2 | n2 | n2 |  |
| combOffset-n2 | 0 | 0 | 0 |  |
| cyclicShift-n2 | 0 | 0 | 0 |  |
| resourceMapping  startPosition | 0 | 0 | 0 |  |
| resourceMapping  nrofSymbols | n1 | n1 | n1 |  |
| resourceMapping  repetitionFactor | n1 | n1 | n1 |  |
| freqDomainPosition | 0 | 0 | 0 |  |
| freqDomainShift | 0 | 0 | 0 |  |
| freqHopping  c-SRS | 14 for test configuration 1,2,4,5  25 for test configuration 3,6 | 25 | 14 | Matches NRB,c |
| freqHopping  b-SRS | 0 | 0 | 0 |  |
| freqHopping  b-hop | 0 | 0 | 0 |  |
| groupOrSequenceHopping | Neither | Neither | Neither |  |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p | sl1 | sl640,5 | sl320, 3 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | 0 | Any 10 bit number |

Table 4.4.1.1.5-3: DRX-Configuration for UL Timing Tests

|  |  |
| --- | --- |
| **Field** | **Test 2** |
| **Value** |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| longDRX-CycleStartOffset | 320 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| NOTE: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]. | |

Table 4.4.1.1.5-4: Te Timing Error Limit

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (KHz)** | **SCS of uplink signals s(KHz)** | **Te** |
| 1 | 15 | 15 | 13.75\*64\*Tc |
| 30 | 11.75\*64\*Tc |
| 60 | 11.75\*64\*Tc |
| 30 | 15 | 9.75\*64\*Tc |
| 30 | 9.75\*64\*Tc |
| 60 | 8.75\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6]. | | | |

Table 4.4.1.1.5-5: Tq Maximum Autonomous Time Adjustment Step and  
Tp Minimum Aggregate Adjustment rate

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Frequency Range** | **SCS of uplink signals (KHz)** | **Tq** | **Tp** | **Maximum Adjustment Rate** |
| 1 | 15 | 6.0\*64\*Tc | 1.9\*64\*Tc | 6.6\*64\*Tc |
| 30 | 6.0\*64\*Tc | 1.9\*64\*Tc | 6.6\*64\*Tc |
| 60 | 6.0\*64\*Tc | 1.9\*64\*Tc | 6.6\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6]. | | | | |

### 4.4.2 UE timer accuracy

### 4.4.3 Timing advance

#### 4.4.3.0Minimum conformance requirements

The timing advance is initiated from PSCell in EN-DC operation mode with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

##### 4.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 4.4.3.0.1-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 4.4.3.0.1-1: UE Timing Advance adjustment accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 | 120 |
| UE Timing Advance adjustment accuracy | ±256 Tc | ±256 Tc | ±128 Tc | ±32 Tc |

##### 4.4.3.0.2 Minimum conformance requirements for timing advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot *n*+ *k* for a timing advance command received in time slot *n*, and the value of *k* is defined in clause 4.2 in TS 38.213 [8]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

The normative reference for this requirement is TS.38.133 [6] clause A.4.4.3.1.

#### 4.4.3.1 EN-DC FR1 timing advance adjustment accuracy

4.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

4.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 4.4.3.0.1 and clause 4.4.3.0.2.

The normative reference for this requirement is TS.38.133 [6] clause A.4.4.3.1.

4.4.3.1.4 Test description

4.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.4.3.1.4.1-1.

Table 4.4.3.1.4.1-1: EN-DC FR1 timing advance adjustment accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.4.3.1.4.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.4.3.1.4.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.4.3.1.4.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.4.3.1.4.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.4.3.1.4.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.4.3.1.4.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.4.3.1.4.1-2

Table 4.4.3.1.4.1-2: Initial conditions for EN-DC FR1 timing advance adjustment accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, E.1.2, and Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

Table 4.4.3.1.4.1-3: General test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF channel number |  | Cell 1: 1  Cell 2: 2 | 1 for E-UTRAN Pcell  2 for NR PSCell |
| DL BWP |  | DLBWP.1.1 | As specified in Table A.8.1-2 |
| UL BWP |  | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | For SCS = 15kHz, *NTA\_new = NTA\_old + 8192\*Tc* (based on equation in TS 38.213 [8] clause 4.2)  For SCS = 30kHz, *NTA\_new = NTA\_old + 4096\*Tc* (based on equation in TS 38.213 [8] clause 4.2) |
| T1 | S | 5 |  |
| T2 | S | 5 |  |

1. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.1.

2. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

4.4.3.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 4.4.3.1.4.1-3 and Table 4.4.3.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in Clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508‑1 [14] clause 4.5. Message content are defined in clause 4.4.3.1.4.3.

2. Set the parameters according to values in Tables 4.4.3.1.4.1-3 and Table 4.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [12]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value of 39 as specified in Table 4.4.3.1.4.1-3.

7. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

8. As specified in clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay should be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

9. The UE Time Alignment Timer, described in clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 4.4.3.0.1‑1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 4.4.3.0.1-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

13. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

14. If any of the above Reconfiguration in Step 12 or 13 fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 3-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

Table 4.4.3.1.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

Table 4.4.3.1.4.3-1: srs-Config setup

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | | |
| --- | --- | --- | --- | --- |
| Information Element | Value/remark | Comment | | Condition |
| SRS-Config ::= SEQUENCE { |  |  | |  |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry |  | |  |
| SRS-ResourceSet[1] SEQUENCE { |  | | entry 1 |  |
| resourceType CHOICE { |  |  | |  |
| periodic SEQUENCE { |  |  | |  |
| } |  |  | |  |
| } |  |  | |  |
| } |  |  | |  |
| } |  |  | |  |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry |  | |  |
| SRS-Resource[1] SEQUENCE { |  | | entry 1 |  |
| freqHopping SEQUENCE { |  |  | |  |
| c-SRS | 12 |  | | Config 1,2,4,5 |
| 24 |  | | Config 3,6 |
| } |  |  | |  |
| groupOrSequenceHopping | neither |  | |  |
| resourceType CHOICE { |  |  | |  |
| periodic SEQUENCE { |  |  | |  |
| periodicityAndOffset-p CHOICE { |  |  | |  |
| sl5 | 2 | Once every 5 Slots | | SCS15 |
| sl5 | 4 | Once every 5 Slots | | SCS30 |
| } |  | |  |  |
| } |  | |  |  |
| } |  | |  |  |
| } |  |  | |  |
| } |  |  | |  |
| } |  |  | |  |

4.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where:

*k* = 5 for Config 1, 2, 3, 4, 5, 6

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in Table 4.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90 %.

Table 4.4.3.1.5-1 and Table 4.4.3.1.5-2 define the primary level settings.

Table 4.4.3.1.5-1: Cell specific test parameters for timing advance

| Parameter | | | Unit | Test1 | |
| --- | --- | --- | --- | --- | --- |
| T1 | T2 |
| Duplex mode | | Config 1,4 |  | FDD | |
| Config 2,3,5,6 | TDD | |
| TDD configuration | | Config 1,4 |  | Not Applicable | |
| Config 2,5 | TDDConf.1.1 | |
| Config 3,6 | TDDConf.2.1 | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | |
| Config 2,5 | 10: NRB,c = 52 | |
| Config 3,6 | 40: NRB,c = 106 | |
| BWP BW | | Config 1,4 | MHz | 10: NRB,c = 52 | |
| Config 2,5 | 10: NRB,c = 52 | |
| Config 3,6 | 40: NRB,c = 106 | |
| DRx Cycle | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | |
| Config 2,5 | SR.1.1 TDD | |
| Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | |
| Config 2,5 | CR.1.1 TDD | |
| Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1,4 |  | CCR.1.1 FDD | |
| Config 2,5 | CCR.1.1 TDD | |
| Config 3,6 | CCR2.1 TDD | |
| OCNG Patterns | | |  | OCNG pattern 1 | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | |
| Config 2,5 | TRS.1.1 TDD | |
| Config 3,6 | TRS.1.2 TDD | |
| SMTC configuration | | Config 1,2,4,5 |  | SMTC.1 FR1 | |
| Config 3,6 | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | |
| Config 3,6 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | |
| Config 3,6 | 30 kHz | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -98 | |
| Config 3,6 | | -95 | |
|  | | | dB | 3 | |
|  | | | dB | 3 | |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -67.57 | |
| Config 3,6 | | dBm/  38.16MHz | -62.58 | |
| Propagation condition | | | - | AWGN | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table 4.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Field | | Value | Comment |
| c-SRS | Config 1,2,4,5 | 12 | Frequency hopping is disabled |
| Config 3,6 | 24 |
| b-SRS | | 0 |
| b-hop | | 0 |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5@2 for SCS 15kHz  sl5@4 for SCS 30kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| Usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 |
| repetitionFactor | | n1 |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |
| NOTE: For further information see clause 6.3.2 in TS 38.331. | | | |

Table 4.4.3.1.5-3: UE Timing Advance adjustment accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 |
| UE Timing Advance adjustment accuracy | ±344 Tc | ±344 Tc | ±216 Tc |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95 %.

## 4.5 Signaling characteristics

### 4.5.1 Radio link monitoring

#### 4.5.1.00 General

The requirements in this section apply for radio link monitoring on PSCell in EN-DC operation mode.

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds Qout and Qin for the purpose of monitoring downlink radio link quality of the cell.

#### 4.5.1.0 Minimum conformance requirements

##### 4.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_out\_SSB [ms] period becomes worse than the threshold Qout\_SSB within TEvaluate\_out\_SSB [ms] evaluation period. The requirements in this section apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 4.5.1.0.1-1.

TEvaluate\_out\_SSB is defined in Table 4.5.1.0.1-1 for FR1.

Table 4.5.1.0.1-1: Evaluation period TEvaluate\_out for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms) |
| no DRX | max(200,ceil(10\*P)\*TSSB) |
| DRX cycle≤320 | max(200,ceil(15\*P)\*max(TDRX,TSSB)) |
| DRX cycle>320 | ceil(10\*P)\*TDRX |
| NOTE: TSSB is the periodicity of SSB configured for RLM. TDRX is the DRX cycle length | |

For FR1,

- P=1/(1 - TSSB/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signaling of *smtc2*is present, TSMTCperiod follows *smtc2*; otherwise TSMTCperiod follows *smtc1.*

The normative reference for this requirement is TS 38.133 [6] clause 8.1.2.

##### 4.5.1.0.2 Void

##### 4.5.1.0.3 Minimum conformance requirements for out-of-sync CSI-RS based RLM

[TS 38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133, clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

[TS 38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_out\_CSI-RS [ms] period becomes worse than the threshold Qout\_CSI-RS within TEvaluate\_out\_CSI-RS [ms] evaluation period.

- TEvaluate\_out\_CSI-RS is defined in Table 4.5.1.0.3-1 for FR1.

For FR1,

- P=1/(1 - TCSI-RS/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

The value of Mout used in Table 4.5.1.0.3-1 is defined as:

- Mout = 20 if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth ≥ 24 PRBs.

Table 4.5.1.0.3-1: Evaluation period TEvaluate\_out\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms) |
| no DRX | max(200, ceil(Mout×P)×TCSI-RS) |
| DRX ≤ 320ms | max(200, ceil(1.5×Mout×P)× max(TDRX, TCSI-RS)) |
| DRX > 320ms | ceil(Mout×P) × TDRX |
| NOTE: TCSI-RS is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10ms, 20 ms or 40 ms. TDRX is the DRX cycle length. | |

[TS 38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS 38.133, clauses 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331.

[TS 38.133, clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than Qout, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331.

The out-of-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least TIndication\_interval.

When DRX is not used TIndication\_interval is max(10ms, TRLM-RS,M), where TRLM,M is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to TSSB specified in clause 8.1.2 if the RLM-RS resource is SSB, or TCSI-RS specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, TIndication\_interval is max(10ms, 1.5\*DRX\_cycle\_length, 1.5\*TRLM-RS,M) if DRX cycle\_length is less than or equal to 320ms, and TIndication\_interval is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

##### 4.5.1.0.4 Minimum conformance requirements for in-sync CSI-RS based RLM

[TS 38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

[TS 38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_in\_CSI-RS [ms] period becomes better than the threshold Qin\_CSI-RS within TEvaluate\_in\_CSI-RS [ms] evaluation period.

- TEvaluate\_in\_CSI-RS is defined in Table 8.1.3.2-1 for FR1.

For FR1,

- P=1/(1 - TCSI-RS/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

The value of Min used in Table 8.1.3.2-1 is defined as:

- Min = 10, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth ≥ 24 PRBs.

Table 8.1.3.2-1: Evaluation period TEvaluate\_in\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_in\_CSI-RS (ms) |
| no DRX | max(100, ceil(Min×P) × TCSI-RS) |
| DRX ≤ 320ms | max(100, ceil(1.5×Min×P)× max(TDRX, TCSI-RS)) |
| DRX > 320ms | ceil(Min×P) × TDRX |
| NOTE: TCSI-RS is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10ms, 20 ms or 40 ms. TDRX is the DRX cycle length. | |

[TS 38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS 38.133, clauses 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

[TS 38.133, clause 8.1.6]

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Qin, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in‑sync indications as specified in TS 38.331 [2].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least TIndication\_interval.

When DRX is not used TIndication\_interval is max(10ms, TRLM-RS,M), where TRLM,M is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to TSSB specified in clause 8.1.2 if the RLM‑RS resource is SSB, or TCSI-RS specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, TIndication\_interval is max(10ms, 1.5\*DRX\_cycle\_length, 1.5\*TRLM-RS,M) if DRX cycle\_length is less than or equal to 320ms, and TIndication\_interval is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

##### 4.5.1.0.5 Requirements for UE configured with Relaxed Measurement Criteria

[TS 38.133, clause 8.1.1.1]

For the UE supporting rlm-Relaxation-r17 and configured with explicit signaling goodServingCellEvaluationRLM, which is always configured to the UE when the network enables RLM relaxation for the UE as specified in TS 38.331 [13], the relaxed requirements defined in clause 4.5.1.0.5.1 for SSB based radio link monitoring and the relaxed requirements defined in clause [4.5.1.0.5.2] for CSI-RS based radio link monitoring are allowed to apply to the relaxed RLM measurements on SpCell after fulfilling the following conditions:

- for the serving cells in intra-band carrier aggregation configured with SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on SCell, when

- the good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the serving cell based on the measurements that are configured for SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on Scell in the intra-band carrier aggregation if the lowMobilityEvaluationConnected is not configured, or

- the UE is also configured with lowMobilityEvaluationConnected and both low mobility criterion defined in clause 5.7.13.1 of TS 38.331 [13] is fulfilled for a period of TSearchDeltaP-Connected and good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the serving cell based on the measurements that are configured for SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on Scell in the intra-band carrier aggregation.

- for other serving cells, when

- the good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the SpCell if the lowMobilityEvaluationConnected is not configured, or

- the UE is also configured with lowMobilityEvaluationConnected and both low mobility criterion defined in clause 5.7.13.1 of TS 38.331 [13] is fulfilled for a period of TSearchDeltaP-Connected and good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the SpCell.

otherwise, UE shall apply the requirements defined in clause 4.5.1.0.1 for SSB based radio link monitoring and the requirements defined in clause 4.5.1.0.3 and 4.5.1.0.4 for CSI-RS based radio link monitoring. Note that when multiple resources are configured on a serving cell for RLM or BFD evaluation, the good serving cell quality critierion is considered as fulfilled for the serving cell when any resource configured for the cell fulfills the good serving defined in clause 5.7.13.2 of TS 38.331 [13].

The UE is no longer allowed to relax RLM measurements and apply the relaxed radio link monitoring provided that at least one of the following conditions is met:

- The UE sends out-of sync indications to the higher layers,

- The timer T310 is running.

- No DRX is used or DRX cycle is longer than 80ms4.5.1.0.5.1 Minimum requirement of SSB based radio link monitoring for UE fulfilling relaxed measurement criteria

[TS 38.133, clause 8.1.2.4]

This clause contains minimum requirements for relaxed radio link monitoring based on SSB.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_out\_SSB\_Relax [ms] period becomes worse than the threshold Qout\_SSB within TEvaluate\_out\_SSB\_Relax [ms] evaluation period.

TEvaluate\_out\_SSB\_Relax is defined in Table 4.5.1.0.5.1-1 for FR1.

The value of P is defined in clause 4.5.1.0.1.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

Table 4.5.1.0.5.1-1: Evaluation period TEvaluate\_out\_SSB\_Relax for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_out\_SSB\_Relax (ms) |
| Max(TDRX,TSSB) ≤80ms | Max(200× K3 NOTE3, Ceil(15 × K1NOTE2 × P) × Max(TDRX,TSSB)) |
| 80ms < Max(TDRX,TSSB) ≤160ms | Ceil(15 × P) × Max(TDRX,TSSB) |
| NOTE 1: TSSB is the periodicity of the SSB configured for RLM. TDRX is the DRX cycle length and no longer than 80ms.  NOTE 2: K1 = 4 for Max(TDRX,TSSB) ≤40ms and K1 = 2 for 40ms<Max(TDRX,TSSB) ≤80ms.  NOTE 3: K3 = K1, if K1 ≤ 2; otherwise K3 = 1. | |

#### 4.5.1.1 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

4.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM RS in non-DRX mode. This test will partly verify the FR1 PSCell radio link monitoring requirements in TS 38.133 [6], clause 8.1.2.

4.5.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.5.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 4.5.1.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.1.

4.5.1.1.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in TS 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.1.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

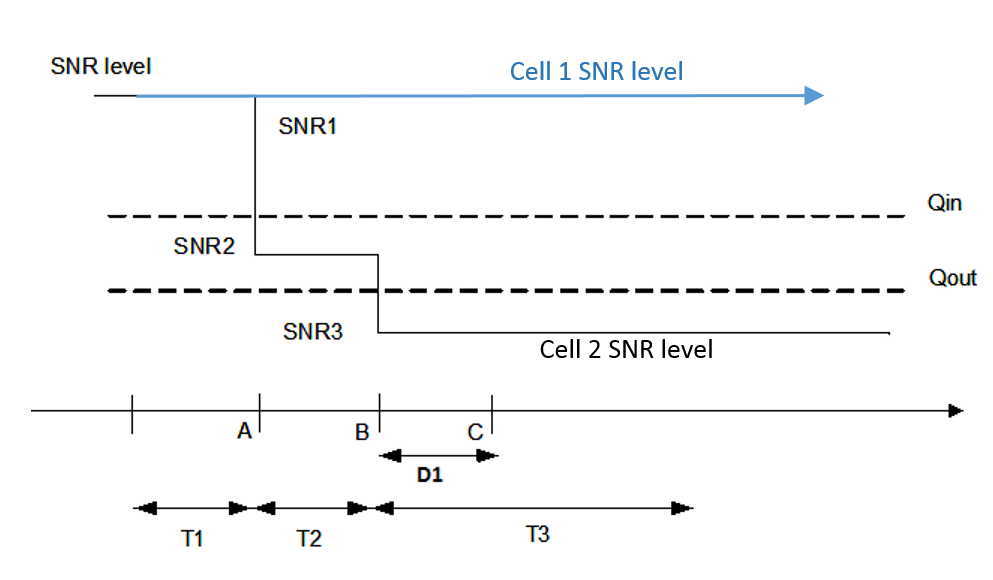


Figure 4.5.1.1.4-1: SNR variation for out-of-sync testing

4.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.1.4.1-1.

Table 4.5.1.1.4.1-1: EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.5.1.1-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.1-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.1-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.1-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.1-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.1-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.1.4.1-2.

Table 4.5.1.1.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring out-of-sync test  
for PSCell configured with SSB-based RLM RS in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

Table 4.5.1.1.4.1-3: Void

1. Message contents are defined in clause 4.5.1.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. The test parameters are given in Table 4.5.1.1.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 4.5.1.1.4.1-4: General test parameters for FR1 out-of-sync testing in non-DRX mode

| Parameter | | | Unit | Value |
| --- | --- | --- | --- | --- |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 |  | CCR.1.3 FDD |
| Config 2, 5 |  | CCR.1.3 TDD |
| Config 3, 6 |  | CCR.2.2 TDD |
| SSB Configuration | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 |  | 30 KHz |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | Table A.7.1-1, PRACH.1 FR1 |
| Config 3, 6 |  | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | *gp0* |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration | | Config 1, 4 |  | CSI-RS.1.1 FDD |
| Config 2, 5 |  | CSI-RS.1.1 TDD |
| Config 3, 6 |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

4.5.1.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 4.5.1.1.4.1-4.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508‑1 [6] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters according to T1 in Table 4.5.1.1.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.1.5-1 for subtests 1 and 2. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.1.5-1 for subtests 1 and 2. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power defined in TS 38.521‑1 [17] clause 6.3.1.5 in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

8. Otherwise the number of failed tests is increased by one and proceed to Step 12.

9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.1.5-1.

10. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

11. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

12. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat steps 4-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions.

Table 4.5.1.1.4.3-1: Common Exception messages for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)  Table H.3.1-4 with A3-offset = 0  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-4 with condition gapUE  Table H.3.4-5 with condition BFD  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM |

Table 4.5.1.1.4.3-2: Void

Table 4.5.1.1.4.3-3: *RLF-TimersAndConstant*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

4.5.1.1.5 Test Requirement

Table 4.5.1.1.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows.

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 %.

Table 4.5.1.1.5-1: Cell specific test parameters for FR1 (Cell 2)  
for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
| T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 4: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.9dB (including test tolerances) | | | | | |

Table 4.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |
| NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap). | |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95 %.

#### 4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

4.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync, for the purpose of monitoring downlink radio link quality of the PSCell, when DRX is not used. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.2.

4.5.1.2.2 Test applicability

This test applies to all types of E-UTRA UEs Release 15 and forward supporting EN-DC.

4.5.1.2.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.2.

4.5.1.2.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.2.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out‑of‑sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

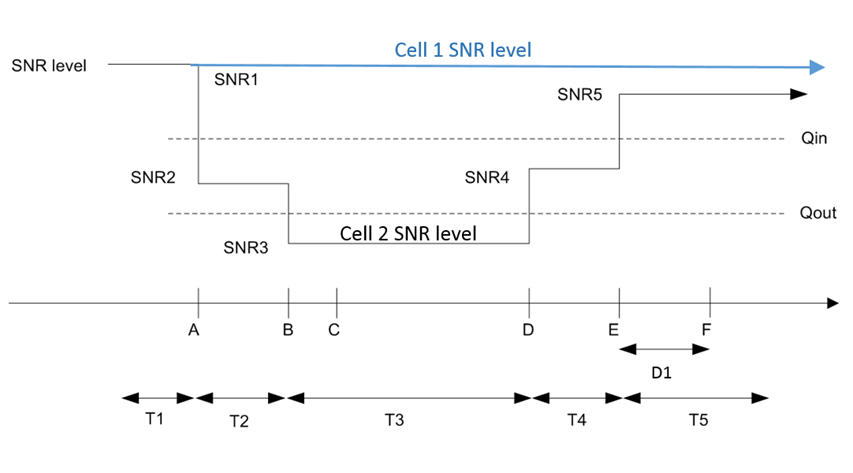


Figure 4.5.1.2.4-1: SNR variation for in-sync testing

4.5.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.2.4.1-1.

Table 4.5.1.2.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.1.2-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.2-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.2-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.2-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.2-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.2-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.2.4.1-2.

Table 4.5.1.2.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.2.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

Table 4.5.1.2.4.1-3: Void

1. Message contents are defined in clause 4.5.1.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The general test parameters are given in Table 4.5.1.2.4.1-4.

4. Downlink signals for NR cell are initially set up according to clause C.1.

Table 4.5.1.2.4.1-4: General test parameters for FR1 in-sync testing in non-DRX mode

| Parameter | | | | Unit | Value |
| --- | --- | --- | --- | --- | --- |
| Test 1 |
| Active E-UTRA PCell | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | |  | 1 |
| Active PSCell | | | |  | Cell 2 |
| RF Channel Number | | | |  | 2 |
| Duplex mode | | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | | | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 |  | CCR.1.1 TDD |
| Config 3, 6 |  | CCR.2.1 TDD |
| SSB Configuration | | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 |  | 30 KHz |
| PRACH Configuration | | | Config 1, 2, 4, 5 |  | Table A.7.1-1, PRACH.1 FR1 |
| Config 3, 6 |  | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | |  | 0 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| In sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 0 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| Out of sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 4 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| DRX | | | |  | *OFF* |
| Gap pattern ID | | | |  | N.A. |
| Layer 3 filtering | | | |  | *Enabled* |
| T310 timer | | | | ms | 1000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1, 4 | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | |  | CSI-RS.1.1 TDD |
| Config 3, 6 | |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | | Config 1, 4 | |  | TRS.1.1 FDD |
| Config 2, 5 | |  | TRS.1.1 TDD |
| Config 3, 6 | |  | TRS.1.2 TDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.24 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| D1 | | | | s | 0.84 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | | |

4.5.1.2.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 4.5.1.2.4.1-4.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508‑1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.2.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires, the SS shall change the SNR value to T2 as specified in Table 4.5.1.2.5-1. T2 starts.

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 4.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 4.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 4.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the subframe according the configured CSI reporting during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and clause 7.3.1 with condition "Short\_DCI" with the following exceptions.

Table 4.5.1.2.4.3-1: Common Exception messages for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM |

Table 4.5.1.2.4.3-2: Void

Table 4.5.1.2.4.3-3: *RLF-TimersAndConstant*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms1000 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

4.5.1.2.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 4.5.1.2.3.

Table 4.5.1.2.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows.

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95 %.

Table 4.5.1.2.5-1: Cell specific test parameters for FR1 (Cell 2) for  
in-sync radio link monitoring tests in non-DRX mode

| Parameter | | Unit | Test 1 | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 4.5.1.2.4-1.  NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8 dB and ‑8.8 dB(including test tolerances). | | | | | | | |

#### 4.5.1.3 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode

4.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] clause 8.1.

4.5.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.5.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 4.5.1.0.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.3.

4.5.1.3.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in TS 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.3.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

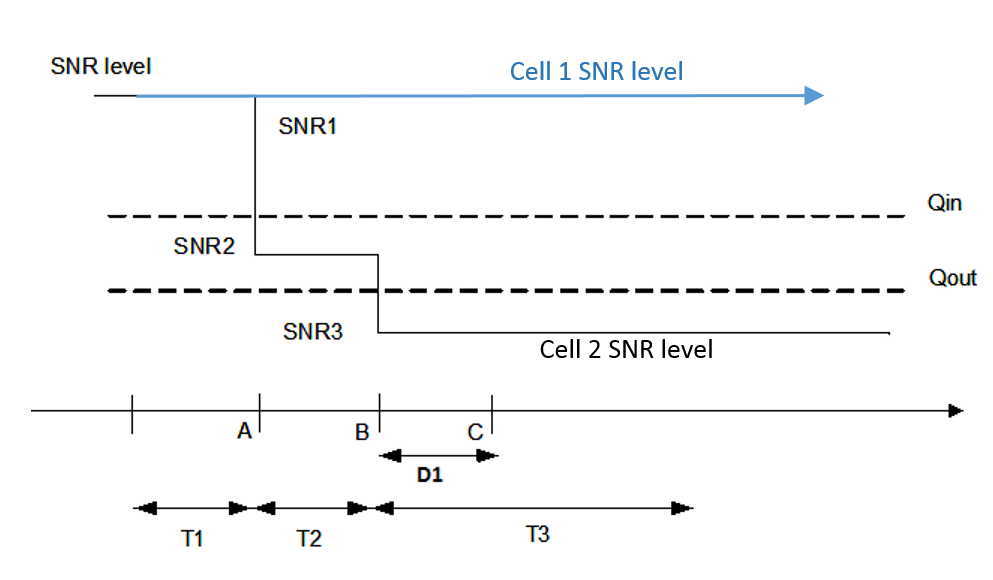


Figure 4.5.1.3.4-1: SNR variation for out-of-sync testing

4.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.3.4.1-1.

Table 4.5.1.3.4.1-1: EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with  
SSB-based RLM RS in DRX mode supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.5.1.3-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.3-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.3-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.3-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.3-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.3-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.3.4.1-2.

Table 4.5.1.3.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring out-of-sync test for  
PSCell configured with SSB-based RLM RS in DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

Table 4.5.1.3.4.1-3: Void

1. Message contents are defined in clause 4.5.1.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. The test parameters are given in Table 4.5.1.3.4.1-4.

4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 4.5.1.3.4.1-4: General test parameters for FR1 out-of-sync testing in DRX mode

| Parameter | | | Unit | Value |
| --- | --- | --- | --- | --- |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 |  | CCR.1.3 FDD |
| Config 2, 5 |  | CCR.1.3 TDD |
| Config 3, 6 |  | CCR.2.2 TDD |
| SSB Configuration | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 |  | 30 KHz |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | Table A.7.1-1, PRACH.1 FR1 |
| Config 3, 6 |  | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 4 |  | CSI-RS.1.1 FDD |
| Config 2, 5 |  | CSI-RS.1.1 TDD |
| Config 3, 6 |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.68 |
| T3 | | | s | 0.68 |
| D1 | | | s | 0.64 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

4.5.1.3.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 4.5.1.3.4.1-4.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508‑1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.3.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.3.5-1 for subtests 1 and 2. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.3.5-1 for subtests 1 and 2. T3 starts.

5. If the SS:

a) detects uplink power equal to or higher than minimum output power defined in TS 38.521‑1 [17] clause 6.3.1.5 in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one, and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.3.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure that PSCell is released.

9. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions:

Table 4.5.1.3.4.3-0: Common Exception messages for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM  Table H.3.7-1 with condition DRX.3 |

Table 4.5.1.3.4.3-1: Void

Table 4.5.1.3.4.3-2: RLF-TimersAndConstant

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

4.5.1.3.5 Test Requirement

Table 4.5.1.3.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 %.

Table 4.5.1.3.5-1: Cell specific test parameters for FR1 (Cell 2) for  
out-of-sync radio link monitoring tests in DRX mode

| Parameter | | Unit | Test 1 | | |
| --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 |
|  | Config 1, 4 | dBm/15KHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.3.4-1.  NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances). | | | | | |

For the test to pass, the total number of successful tests shall be more than 90 % of the cases with a confidence level of 95 %.

#### 4.5.1.4 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB‑based RLM RS in DRX mode

4.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

4.5.1.4.2 Test applicability

This test applies to all types of E-UTRA UE Release 15 and forward supporting EN-DC FR1 and long DRX cycle.

4.5.1.4.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.2. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.4.

4.5.1.4.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.4.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

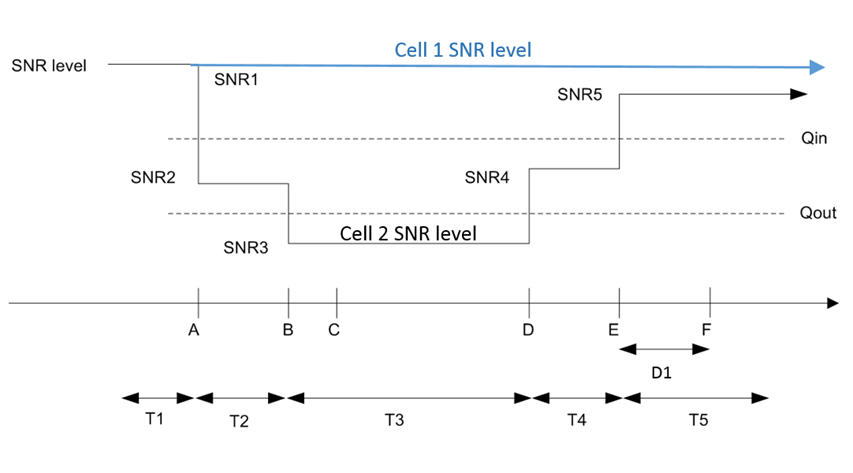


Figure 4.5.1.4.4-1 - SNR variation for in-sync testing

4.5.1.4.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 4.5.1.4.4.1-1.

Table 4.5.1.4.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.1.4-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.4-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.4-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.4-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.4-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.4-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.4.4.1-2.

Table 4.5.1.4.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

Table 4.5.1.4.4.1-3: Void

1. Message contents are defined in clause 4.5.1.4.4.3.

2. The power levels and settings for Cell 1 are set according to clause A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. The general test parameters are given in Table 4.5.1.4.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to clause C.1.

Table 4.5.1.4.4.1-4: General test parameters for FR1 in-sync testing in DRX mode

| Parameter | | | | Unit | Value |
| --- | --- | --- | --- | --- | --- |
| Test 1 |
| Active E-UTRA PCell | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | |  | 1 |
| Active PSCell | | | |  | Cell 2 |
| RF Channel Number | | | |  | 2 |
| Duplex mode | | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | | | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 |  | CCR.1.1 TDD |
| Config 3, 6 |  | CCR.2.1 TDD |
| SSB Configuration | | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 |  | 30 KHz |
| PRACH Configuration | | | Config 1, 2, 4, 5 |  | Table A.7.1-1, PRACH.1 FR1 |
| Config 3, 6 |  | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | |  | 0 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| In sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 0 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| Out of sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 4 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| DRX Configuration | | | |  | DRX.3 |
| Gap pattern ID | | | |  | N.A. |
| Layer 3 filtering | | | |  | *Enabled* |
| T310 timer | | | | ms | 1000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1, 4 | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | |  | CSI-RS.1.1 TDD |
| Config 3, 6 | |  | CSI-RS.2.1 TDD |
| CSI-RS tracking | | Config 1, 4 | |  | TRS.1.1 FDD |
| Config 2, 5 | |  | TRS.1.1 TDD |
| Config 3, 6 | |  | TRS.1.2 TDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.64 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| D1 | | | | s | 0.84 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | | |

4.5.1.4.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 4.5.1.4.4.1-4.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.4.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the subframe according the configured CSI reporting mode (PUCCH 1-0) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions.

Table 4.5.1.4.4.3-0: Common Exception messages for EN-DC FR1 radio link monitoring in-sync test  
for PSCell configured with SSB-based RLM RS in DRX mode test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM  Table H.3.7-1 with condition DRX.3 |

Table 4.5.1.4.4.3-1: Void

Table 4.5.1.4.4.3-2: RLF-TimersAndConstant

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms1000 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

4.5.1.4.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 4.5.1.4.3.

Table 4.5.1.4.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90 % with a confidence interval of 95 %.

Table 4.5.1.4.5-1: Cell specific test parameters for FR1 (Cell 2) for  
in-sync radio link monitoring tests in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 4.5.1.4.4-1.  NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and ‑8.0-TT, which are -18.8dB and -8.8dB(including test tolerances). | | | | | | | |

#### 4.5.1.5 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

4.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

4.5.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

4.5.1.5.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.3. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.5.

4.5.1.5.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.



Figure 4.5.1.5.4-1: SNR variation for out-of-sync testing

4.5.1.5.4.1 Initial conditions

Test 4.5.1.5 can be run in one of the configurations defined in Table 4.5.1.5.4.1-1.

Table 4.5.1.5.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.1.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.5.4.1-2.

Table 4.5.1.5.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

1. The test parameters are given in Table 4.5.1.5.4.1-3 below.

2. Message contents are defined in clause 4.5.1.5.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.1.5.4.1-3: General test parameters for FR1 PSCell for  
CSI-RS out-of-sync testing in non-DRX mode

| Parameter | | | | Unit | Value |
| --- | --- | --- | --- | --- | --- |
| Test 1 |
| Active E-UTRA PCell | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | |  | 1 |
| Active PSCell | | | |  | Cell 2 |
| RF Channel Number | | | |  | 2 |
| Duplex mode | | Config 1, 4 | |  | FDD |
| Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | | Config 1, 4 | |  | Not Applicable |
| Config 2, 5 | | TDDConf.1.1 |
| Config 3, 6 | | TDDConf.2.1 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | |  | CR.1.1 FDD |
| Config 2, 5 | | CR.1.1 TDD |
| Config 3, 6 | | CR.2.1 TDD |
| DedicatedCORESET Reference Channel | | Config 1, 4 | |  | CCR.1.3 FDD |
| Config 2, 5 | | CCR.1.3 TDD |
| Config 3, 6 | | CCR.2.2 TDD |
| SSB Configuration | | Config 1, 4 | |  | SSB.1 FR1 |
| Config 2, 5 | | SSB.1 FR1 |
| Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 | |  | SMTC.1 |
| Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 | |  | 15 KHz |
| Config 3, 6 | | 30 KHz |
| TRS configuration | | Config 1, 4 | |  | TRS.1.1 FDD |
| Config 2, 5 | |  | TRS.1.1 TDD |
| Config 3, 6 | |  | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | |  | | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 | |  | | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 | |  | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | |  | | TCI.State.2 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| Out of sync transmission parameters | | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | | |  | *OFF* |
| Gap pattern ID | | | |  | *gp0* |
| Layer 3 filtering | | | |  | *Enabled* |
| T310 timer | | | | ms | *0* |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS configuration | | Config 1, 4 | |  | CSI-RS 1.1 FDD |
| Config 2, 5 | | CSI-RS.1.1 TDD |
| Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.48 |
| T3 | | | | s | 0.48 |
| D1 | | | | s | 0.44 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 2: E-UTRAN is in non-DRX mode under test. | | | | | |

Table 4.5.1.5.4.1-4: Measurement gap configuration for  
FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |
| NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. | |

4.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters of Cell 2 according to T1 in Table 4.5.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.5.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.5.5-1. T3 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.5.5-1.

9. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG\_and\_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG\_and\_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 4-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions.

Table 4.5.1.5.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)  Table H.3.1-4 with A3-offset = 0  Table H.3.1-9  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-4 with condition gapUE  Table H.3.4-5 with condition BFD  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM |

Table 4.5.1.5.4.3-2: Void

4.5.1.5.5 Test requirement

Tables 4.5.1.5.4.1-2 and 4.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode.

Table 4.5.1.5.5-1: Cell specific test parameters for FR1 for  
CSI-RS out-of-sync radio link monitoring in non-DRX mode

| **Parameter** | | **Unit** | **Test 1** | | |
| --- | --- | --- | --- | --- | --- |
| **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 |
|  | Config 1, 4 | dBm/15KHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.5.4-1.  NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances). | | | | | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all slots configured for CSI transmission according the configured CSI reporting mode on PUCCH.

The UE shall stop transmitting uplink signal no later than time point C (D1 after the start of time duration T3).

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

- UE output power equal to or less than Transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 4.5.1.6 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

4.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

4.5.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

4.5.1.6.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.6.

4.5.1.6.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.



Figure 4.5.1.6.4-1: SNR variation for In-sync testing

4.5.1.6.4.1 Initial conditions

Test 4.5.1.6 can be run in one of the configurations defined in Table 4.5.1.6.4.1-1.

Table 4.5.1.6.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.1.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configue the test equipment and the DUT according to the parameters in Table 4.5.1.6.4.1-2.

Table 4.5.1.6.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in non-DRX mode

| Parameter | Value | | Comment |
| --- | --- | --- | --- |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

1. The test parameters are given in Table 4.5.1.6.4.1-3 below.

2. Message contents are defined in clause 4.5.1.6.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.2 and C.1.3.

Table 4.5.1.6.4.1-3: General test parameters for FR1 PSCell for  
CSI-RS In-sync testing in non-DRX mode

| **Parameter** | | | | **Unit** | **Value** |
| --- | --- | --- | --- | --- | --- |
| **Test 1** |
| Active E-UTRA PCell | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | |  | 1 |
| Active PSCell | | | |  | Cell 2 |
| RF Channel Number | | | |  | 2 |
| Duplex mode | | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 | TDD |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf. 2.1 |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 | CR.1.1 TDD |
| Config 3, 6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 | CCR.1.1 TDD |
| Config 3, 6 | CCR.2.1 TDD |
| SSB Configuration | | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| SMTC Configuration | | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 | 30 KHz |
| TRS configuration | | | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| CSI-RS for RLM | | | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | |  |  | TCI.State.2 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 4 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| In sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| DRX | | | |  | *OFF* |
| Gap pattern ID | | | |  | N.A. |
| Layer 3 filtering | | | |  | *Enabled* |
| T310 timer | | | | ms | 1000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS for reporting | | Config 1, 4 | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | | CSI-RS.1.1 TDD |
| Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.44 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| T6 | | | | s | 0.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 2: E-UTRAN is in non-DRX mode under test. | | | | | |

4.5.1.6.4.2 Test procedure and Test Mode *On*

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and\_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.6.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 4.5.1.6.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM |

4.5.1.6.5 Test requirement

Tables 4.5.1.6.4.1-2 and 4.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode.

Table 4.5.1.6.5-1: Cell specific test parameters for FR1 for  
CSI-RS In-sync radio link monitoring in non-DRX mode

| **Parameter** | | **Unit** | **Test 1** | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1, 4 | dBm/15KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 4.5.1.6.4-1.  NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB (including test tolerances). | | | | | | | |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least in all slots configured for CSI transmission according to the configured CSI reporting mode on PUCCH.

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 4.5.1.7 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

4.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

4.5.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM and long DRX cycle.

4.5.1.7.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.7.

4.5.1.7.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.



Figure 4.5.1.7.4-1: SNR variation for out-of-sync testing

4.5.1.7.4.1 Initial conditions

Test 4.5.1.7 can be run in one of the configurations defined in Table 4.5.1.7.4.1-1.

Table 4.5.1.7.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.1.7-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.7-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.7-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.7-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.7-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.7-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configue the test equipment and the DUT according to the parameters in Table 4.5.1.7.4.1-2.

Table 4.5.1.7.4.1-2: Initial conditions for CSI-RS out-of-sync radio link monitoring in DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

1. The test parameters are given in Table 4.5.1.7.4.1-3 below.

2. Message contents are defined in clause 4.5.1.7.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.1.7.4.1-3: General test parameters for FR1 PSCell for  
CSI-RS out-of-sync testing in DRX mode

| Parameter | | | Unit | Value |
| --- | --- | --- | --- | --- |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 | TDD |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 | CR.1.1 TDD |
| Config 3, 6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 |  | CCR.1.3 FDD |
| Config 2, 5 | CCR.1.3 TDD |
| Config 3, 6 | CCR.2.2 TDD |
| SSB Configuration | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 | 30 KHz |
| TRS configuration | | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| CSI-RS for RLM | | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | |  | TCI.State.2 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync transmission parameters | | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for reporting | Config 1, 4 | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | | CSI-RS.1.1 TDD |
| Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 1.28 |
| T3 | | | s | 1.28 |
| D1 | | | s | 1.24 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 2: E-UTRAN is in non-DRX mode under test. | | | | |

4.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG\_and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.7.5-1. T3 starts.

5. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and\_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions.

Table 4.5.1.7.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM  Table H.3.7-1 with condition DRX.3 |

Table 4.5.1.7.4.3-2: RLF-TimersAndConstant

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| } |  |  |  |

4.5.1.7.5 Test requirement

Tables 4.5.1.7.4.1-2 and 4.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode.

Table 4.5.1.7.5-1: Cell specific test parameters for FR1 for  
CSI-RS out-of-sync radio link monitoring in DRX mode

| **Parameter** | | **Unit** | **Test 1** | | |
| --- | --- | --- | --- | --- | --- |
| **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 |
|  | Config 1, 4 | dBm/15KHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.1.7.4-1.  NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances). | | | | | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least once every DRX cycle, in the On-duration part of the cycle in the slots configured for CSI transmission according the configured CSI reporting mode on PUCCH.

The UE shall stop transmitting uplink signal no later than time point C (D1 after the start of time duration T3).

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

- UE output power equal to or less than Transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

The rate of correct events observed during repeated tests shall be at least 90 % with a confidence level of 95 %.

4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

4.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

4.5.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM and long DRX cycle.

4.5.1.8.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.8.

4.5.1.8.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.



Figure 4.5.1.8.4-1: SNR variation for In-sync testing

4.5.1.8.4.1 Initial conditions

Test 4.5.1.8 can be run in one of the configurations defined in Table 4.5.1.8.4.1-1.

Table 4.5.1.8.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.1.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configue the test equipment and the DUT according to the parameters in Table 4.5.1.8.4.1-2.

Table 4.5.1.8.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |  |

1. The test parameters are given in Table 4.5.1.8.4.1-3 below.

2. Message contents are defined in clause 4.5.1.8.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.1.8.4.1-3: General test parameters for FR1 PSCell for CSI-RS In-sync testing in DRX mode

| **Parameter** | | | | | **Unit** | **Value** |
| --- | --- | --- | --- | --- | --- | --- |
| **Test 1** |
| Active E-UTRA PCell | | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | | |  | 1 |
| Active PSCell | | | | |  | Cell 2 |
| RF Channel Number | | | | |  | 2 |
| Duplex mode | | | Config 1, 4 | |  | FDD |
| Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | | | Config 1, 4 | |  | Not Applicable |
| Config 2, 5 | | TDDConf.1.1 |
| Config 3, 6 | | TDDConf.2.1 |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.1.1 |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | | Config 1, 4 | |  | CR.1.1 FDD |
| Config 2, 5 | | CR.1.1 TDD |
| Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | |  | CCR.1.1 FDD |
| Config 2, 5 | | CCR.1.1 TDD |
| Config 3, 6 | | CCR.2.1 TDD |
| SSB Configuration | | | Config 1, 4 | |  | SSB.1 FR1 |
| Config 2, 5 | | SSB.1 FR1 |
| Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | | | Config 1, 2, 4, 5 | |  | SMTC.1 |
| Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 | |  | 15 KHz |
| Config 3, 6 | | 30 KHz |
| TRS configuration | | | Config 1, 4 | |  | TRS.1.1 FDD |
| Config 2, 5 | |  | TRS.1.1 TDD |
| Config 3, 6 | |  | TRS.1.2 TDD |
| CSI-RS for RLM | | | | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | | |  | TCI.State.2 |
| OCNG parameters | | | | |  | OP.1 |
| CP length | | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | | |  | 2x2 Low |
| Out of sync transmission parameters | | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 4 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| In sync transmission parameters | | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| DRX | | | | |  | DRX.3 |
| Gap pattern ID | | | | |  | *gp0* |
| Layer 3 filtering | | | | |  | *Enabled* |
| T310 timer | | | | | ms | 2000 |
| T311 timer | | | | | ms | 1000 |
| N310 | | | | |  | 1 |
| N311 | | | | |  | 1 |
| CSI for reporting | Config 1, 4 | | | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | | | | CSI-RS.1.1 TDD |
| Config 3, 6 | | | | CSI-RS.2.1 TDD |
| T1 | | | | | s | 0.2 |
| T2 | | | | | s | 0.2 |
| T3 | | | | | s | 1.24 |
| T4 | | | | | s | 0.2 |
| T5 | | | | | s | 1.88 |
| T6 | | | | | s | 1.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 2: E-UTRAN is in non-DRX mode under test. | | | | | | |

Table 4.5.1.8.4.1-4: Measurement gap configuration for  
FR1 CSI-RS In-sync radio link monitoring in DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |
| NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. | |

4.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and\_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters of Cell 2 according to T1 in Table 4.5.1.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.8.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.8.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.8.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.8.5-1. T5 starts.

9. If the SS detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the configured slots for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 4-10 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 4.5.1.8.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)  Table H.3.1-4 with A3-offset = 0  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-4 with condition gapUE  Table H.3.4-5 with condition BFD  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM  Table H.3.7-1 with condition DRX.3 and Gap |

Table 4.5.1.8.4.3-2: Void

Table 4.5.1.8.4.3-3: RLF-TimersAndConstant

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms2000 |  |  |
| } |  |  |  |

4.5.1.8.5 Test requirement

Tables 4.5.1.8.4.1-2 and 4.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode.

Table 4.5.1.8.5-1: Cell specific test parameters for FR1 for  
CSI-RS In-sync radio link monitoring in DRX mode

| **Parameter** | | **Unit** | **Test 1** | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 2, 5 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| Config 3, 6 | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1, 4 | dBm/15KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 4.5.1.8.4-1.  NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances). | | | | | | | |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least once every DRX cycle, in the ON-duration part of the cycle in the slots configured for CSI transmission according to the configured CSI reporting mode on PUCCH.

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than Transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 4.5.1.9 EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

Editor's Note:

* MU and TT analysis is incomplete
* Message contents needs to be updated
* Test procedure needs to be updated
* Test applicability needs to be updated

4.5.1.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements specified in clause 4.5.1.0.5.1 for UE fulfilling good serving cell quality criterion and low mobility criterion, if configured.

4.5.1.9.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward, supporting EN-DC and [relaxed measurement criterion].

4.5.1.9.3 Minimum conformance requirement

The requirements for UE supporting relaxed measurement criterion are specified in clause 4.5.1.0.5. The minimum requirements for SSB-based RLM with this criterion are specified in clause 4.5.1.0.5.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.9.

4.5.1.9.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table 4.5.1.9.4.1-1. The test parameters are given in Tables 4.5.1.9.4.1-3 and 4.5.1.9.5-1.

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.9.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states.

Text

Description automatically generated with medium confidence

Figure 4.5.1.9.4-1: SNR variation for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

4.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.9.4.1-1.

Table 4.5.1.9.4.1-1: Supported test configurations for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.5.1.9-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.1.9-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.1.9-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.1.9-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.1.9-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.1.9-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.9.4.1-2.

Table 4.5.1.9.4.1-2: Initial conditions for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use TS 38.508-1 [14] A.3.2.5.2 for DUT part and TS 38.508-1 [14] A.3.1.7.4 for TE Part | |  |

1. Message contents are defined in clause 4.5.1.9.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. The test parameters are given in Table 4.5.1.9.4.1-3 below.

4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 4.5.1.9.4.1-3: General test parameters for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 4 |  | FDD |
|  | | Config 2, 3, 5, 6 |  | TDD |
| BWchannel | | Config 1, 4 | MHz | 10: NRB,c = 52 |
|  | | Config 2, 5 |  | 10: NRB,c = 52 |
|  | | Config 3, 6 |  | 40: NRB,c = 106 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD | | Config 1, 4 |  | Not Applicable |
| Configuration | | Config 2, 5 |  | TDDConf.1.1 |
|  | | Config 3, 6 |  | TDDConf.2.1 |
| CORESET | | Config 1, 4 |  | CR.1.1 FDD |
| Reference | | Config 2, 5 |  | CR.1.1 TDD |
| Channel | | Config 3, 6 |  | CR.2.1 TDD |
| SSB | | Config 1, 4 |  | SSB.1 FR1 |
| Configuration | | Config 2, 5 |  | SSB.1 FR1 |
|  | | Config 3, 6 |  | SSB.2 FR1 |
| SMTC | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Configuration | | Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH | | Config 1, 2, 4, 5 |  | 15 kHz |
| subcarrier spacing | | Config 3, 6 |  | 30 kHz |
| PRACH | | Config 1, 2, 4, 5 |  | Table A.7.1-1 |
| Configuration | | Config 3, 6 |  | Table A.7.1-1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync | DCI format | |  | 1-0 |
| transmission parameters | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | Enabled |
| T310 timer | | | ms | 0 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI | | Config 1, 4 |  | CSI-RS.1.1 FDD |
| reporting | | Config 2, 5 |  | CSI-RS.1.1 TDD |
|  | | Config 3, 6 |  | CSI-RS.2.1 TDD |
| CSI-RS for | | Config 1, 4 |  | TRS.1.1 FDD |
| tracking | | Config 2, 5 |  | TRS.1.1 TDD |
|  | | Config 3, 6 |  | TRS.1.2 TDD |
| T1 | | | s | 5.2 |
| T2 | | | s | 0.68 |
| T3 | | | s | 2.48 |
| D1 | | | s | 2.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts.  Note 3: E-UTRAN is in non-DRX mode under test. | | | | |

4.5.1.9.4.2 Test Procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, I .e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508‑1 [14] clause 4.5.

2. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) configuring the UE with [relaxed measurement criterion] and for measurements as specified in section 4.5.1.9.4.3.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfiguration* message).

4. Set the parameters according to T1 in Table 4.5.1.9.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.9.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.9.5-1. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power defined in TS 38.521‑1 [17] clause 6.3.1.5 in the on-duration part of every DRX cycle in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 in any of such CSI transmission occasions, from time point C (D1 after the start of T3) until T3 expires,

the number of successful tests is increased by one. Otherwise, the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.9.5-1.

9. If the UE has not re-established the connection in at least 1s, go to step 10. Otherwise go to step 11.

10. The SS shall ensure the PSCell is released. Then it shall transmit an *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If the reconfiguration fails go to step 11, otherwise go to step 12.

11. Switch off and on the UE and go to step 12.

12. Repeat steps 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.9.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with the following exceptions.

Editor's Note: Message contents specific to relaxed measurement criterion are FFS

Table 4.5.1.9.4.3-1: Common Exception messages for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition L3 FILTERING NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO  Table H.3.1-4 with A3-offset = 0  [Table H.3.1-8 with Condition SSB RLM]  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-3  Table H.3.5-4  [Table H.3.5-9 with Condition SSB RLM]  Table H.3.7-1 with Condition DRX.3 |

Table 4.5.1.9.4.3-2: *RLF-TimersAndConstant* for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

4.5.1.9.5 Test Requirement

Table 4.5.1.9.5-1 defines the cell specific primary level settings including test tolerances for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion.

Table 4.5.1.9.5-1: Cell specific test parameters for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on | Config 1, 4 | dB | 1+TT | 1+TT | -15+TT |
| RLM-RS | Config 2, 5 |  | 1+TT | 1+TT | -15+TT |
|  | Config 3, 6 |  | 1+TT | 1+TT | -15+TT |
|  | Config 1, 4 | dBm/15kHz | -98+TT | | |
|  | Config 2, 5 |  | -98+TT | | |
|  | Config 3, 6 |  | -98+TT | | |
|  | Config 1, 4 | dBm/SCS | -98+TT | | |
|  | Config 2, 5 |  | -98+TT | | |
|  | Config 3, 6 |  | -95+TT | | |
| goodServingCellEvaluationRLM | |  | configured | | |
| offset in goodServingCellEvaluationRLM | | dB | Not configured | | |
| goodServingCellEvaluationRLM | | dB | 0 | | |
| s-SearchDeltaP-Connected | | dB | 3 | | |
| t-SearchDeltaP-Connected | | s | 5 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.9.4-1.  Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4. | | | | | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95 %.

### 4.5.2 Interruption

#### 4.5.2.0 Minimum conformance requirements

##### 4.5.2.0.1 Minimum conformance requirements for interruptions at transitions between active and non-active during DRX.

[TS 38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active druing DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 4.5.2.0.1-1.

Each interruption shall not exceed X slot as defined in table 4.5.2.0.1-1.

Table 4.5.2.0.1-1: Interruption length X at transition between active and non-active during DRX

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X | |
| Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 1 | 2 |
| 2 | 0.25 | 3 | |
| 3 | 0.125 | 5 | |

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.1.

##### 4.5.2.0.2 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS 38.133, clause 8.2.1.2.5.1]

Interruption on PSCell and other active NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

[TS 38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 4.5.2.0.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 4.5.2.0.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 4.5.2.0.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 4.5.2.0.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

Table 4.5.2.0.2-1: Interruption duration for SCell activation/deactivation for inter-band CA

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 2 |
| 3 | 0.125 | 4 |

Table 4.5.2.0.2-2: Interruption duration for SCell activation/deactivation for intra-band CA

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length** |
| 0 | 1 | 1 + TSMTC\_duration |
| 1 | 0.5 | 1 + TSMTC\_duration |
| 2 | 0.25 | 2 + TSMTC\_duration |
| 3 | 0.125 | 4 + TSMTC\_duration |
| NOTE: TSMTC\_duration is  - the longest SMTC duration among all above activated serving cells and the SCell being activated when one SCell is activated;  - the longest SMTC duration among all activated serving cells in the same band when one SCell is deactivated. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

##### 4.5.2.0.3 Minimum conformance requirements for interruptions during measurements on deactivated E-UTRAN SCC

[TS 38.133 clause 8.2.1.2.5.2]

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCellsis 640 ms or longer.

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [2]for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [2].

Each interruption shall not exceed:

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 4.5.2.0.3-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X3 slot | Interruption length Y3 slot |
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 1 | 1 |
| 2 | 0.25 | 2 | 2 |
| 3 | 0.125 | 4 | 4 |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

##### 4.5.2.0.4 Minimum conformance requirements for interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to an active UL BWP of another activated carrier;

- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;

- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];

- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].

- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in SCG.

- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 4.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 4.5.2.0.4-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 4.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 4.5.2.0.4-2.

Table 4.5.2.0.4-1: Interruption length X1 (slot)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NR Slot length | SRS carrier | Interruption length X1 (slots) | |
|  | (ms) of victim cell | switching time (us)Note 1 | Sub carrier spacing for aggressor cell (kHz) | |
|  |  |  | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
|  |  | 300, 500 | 2 | 2 |
|  |  | 900 | 3 | 3 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
|  |  | 300, 500 | 3 | 3 |
|  |  | 900 | 4 | 4 |
| 2 | 0.25 | ≤ 200 | 4 | 3 |
|  |  | 300, 500 | 5 | 4 |
|  |  | 900 | 7 | 6 |
| 3 | 0.125 | ≤ 200 | 7 | 5 |
|  |  | 300, 500 | 9 | 7 |
|  |  | 900 | 12 | 10 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

Table 4.5.2.0.4-2: Interruption length X2 (slot)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NR Slot | SRS carrier | Interruption length X2 (slots) | |
|  | length (ms) of victim cell | switching time (us) Note1 | Sub carrier spacing for aggressor cell (kHz) | |
|  |  |  | 60 | 120 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| 1 | 0.5 | ≤ 200 | 2 | 2 |
| 2 | 0.25 | ≤ 200 | 3 | 3 |
| 3 | 0.125 | ≤ 200 | 4 | 4 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 4.5.2.0.4-1 and in Table 4.5.2.0.4-2 based on SRS carrier switching time ≤ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 4.5.2.0.4-1 and in Table 4.5.2.0.4-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 4.5.2.0.4.

##### 4.5.2.0.5 Minimum conformance requirements for interruptions at E-UTRA SRS carrier based switching

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] and/or non-contention based PRACH on a PUSCH-less carrier of E-UTRA SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD E-UTRA carrier;

- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] for periodic SRS transmission;

- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex [15];

- the SRS switching is not colliding with any other transmission with higher priority defined in TS36.213 [26];

- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS36.213 [26];

- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [2], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [25], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 4.5.2.0.5-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 4.5.2.0.5-1

Table 4.5.2.0.5-1: Interruption length X3 (slot)

|  |  |  |
| --- | --- | --- |
|  | NR Slot | Interruption length X3 |
|  | length (ms) | (slots) |
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

The normative reference for this requirement is TS 38.133 [6] clause 4.5.2.0.5.

#### 4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

4.5.2.1.1 Test purpose

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC.

4.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1 and long DRX cycle.

4.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.1.

4.5.2.1.4 Test description

4.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.1.4.1-1.

Table 4.5.2.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.1.4.1-2.

Table 4.5.2.1.4.1-2: Initial conditions for EN-DC FR1 interruptions at transitions between active and  
non-active during DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.1.4.1-3.

2. Message contents are defined in clause 4.5.2.1.4.3.

3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.1.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions at  
transitions between active and non-active during DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell 2 |
| DRX |  | DRX.4 | DRX related parameters are defined in TS 38.133 Table A.3.3.4-1 |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 10 |  |

4.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On*according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 4.5.2.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 4.5.2.1.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no two consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX".

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

12. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

4.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.2.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.7-2 with Condition DRX.4 |

4.5.2.1.5 Test requirement

Table 4.5.2.1.5-1 defines the NR cell specific primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

Table 4.5.2.1.5-1: NR Cell specific test parameters for E-UTRAN - NR FR1 interruptions at  
transitions between active and non-active during DRX in synchronous EN-DC

| Parameter | | Unit | Cell 2 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | 10: NRB,c = 52 |
| Config 2,5 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0. 1 |
| Config 2,5 | DLBWP.0.1 |
| Config 3,6 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 | DLBWP.1.1 |
| Config 3,6 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 | ULBWP.0.1 |
| Config 3,6 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 | ULBWP.1.1 |
| Config 3,6 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 |  | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
|  |  |  |  |
|  |  |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Time offset to cell1 Note 4 | | μs | 3 for intra-band EN-DC,  33 for inter-band EN-DC |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells. | | | |

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X slots as defined in Table 4.5.2.1.5-2.

Table 4.5.2.1.5-2: Interruption length X at transition between active and non-active during DRX

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

4.5.2.2.1 Test purpose

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC.

4.5.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1 and long DRX cycle.

4.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.2.

4.5.2.2.4 Test description

4.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.2.4.1-1.

Table 4.5.2.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.2.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.2.4.1-2.

Table 4.5.2.2.4.1-2: Initial conditions for EN-DC FR1 interruptions at transitions between active and  
non-active during DRX in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.2.4.1-3.

2. Message contents are defined in clause 4.5.2.2.4.3.

3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.2.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions at  
transitions between active and non-active during DRX in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell 2 |
| DRX |  | DRX.4 | DRX related parameters are defined in TS 38.133 table A.3.3.4-1 |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 10 |  |

4.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 4.5.2.2.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 4.5.2.2.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no longer than X consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX". Where

- For test configuration 4.5.2.2-1 and 4.5.2.2-4:

- X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length.

- For test configuration other than 4.5.2.2-1 and 4.5.2.2-4:

- X = interruption length.

- Interruption length is given in Table 4.5.2.2.5-2.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

12. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

4.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.2.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.7-2 with Condition DRX.4 |

4.5.2.2.5 Test requirement

Table 4.5.2.2.5-1 define the NR cell specific primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

Table 4.5.2.2.5-1: NR Cell specific test parameters for E-UTRAN - NR FR1 interruptions at  
transitions between active and non-active during DRX in asynchronous EN-DC

| Parameter | | | Unit | Cell 2 |
| --- | --- | --- | --- | --- |
| Frequency Range | | |  | FR1 |
| Duplex mode | Config 1,4 | |  | FDD |
| Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | |  | Not Applicable |
| Config 2,5 | | TDDConf.1.1 |
| Config 3,6 | | TDDConf.2.1 |
| BWchannel | Config 1,4 | |  | 10: NRB,c = 52 |
| Config 2,5 | | 10: NRB,c = 52 |
| Config 3,6 | | 40: NRB,c = 106 |
| Initial DL BWP Configuration | Config 1,4 | |  | DLBWP.0.1 |
| Config 2,5 | | DLBWP.0.1 |
| Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | |  | DLBWP.1.1 |
| Config 2,5 | | DLBWP.1.1 |
| Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | |  | ULBWP.0.1 |
| Config 2,5 | | ULBWP.0.1 |
| Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | |  | ULBWP.1.1 |
| Config 2,5 | | ULBWP.1.1 |
| Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | |  | SR.1.1 FDD |
| Config 2,5 | | SR.1.1 TDD |
| Config 3,6 | | SR2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | |  | CR.1.1 FDD |
| Config 2,5 | | CR.1.1 TDD |
| Config 3,6 | | CR2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | |  | CCR.1.1 FDD |
| Config 2,5 | | CCR.1.1 TDD |
| Config 3,6 | | CCR.2.1 TDD |
| OCNG Patterns | | |  | OP.1 |
| SMTC Configuration | | |  | SMTC.1 |
| TRS configuration | Config 1,4 | |  | TRS.1.1 FDD |
| Config 2,5 | |  | TRS.1.1 TDD |
| Config 3,6 | |  | TRS.1.2 TDD |
| SSB Configuration | Config 1,2,4,5 | |  | SSB.1 FR1 |
| Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| NocNote 2 | | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | | dBm/15 kHz | -87 |
| Ês/Iot | | | dB | 17 |
| Ês/Noc | | | dB | 17 |
| NocNote 2 | Config 1,2,4,5 | | -104 | -104 |
| Config 3,6 | | -101 |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -58.96 |
| Config 3,6 | | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1Note 4 | | Config 1,2,4,5 | μs | 500 | |
| Config 3,6 | 250 | |
| Propagation Condition | | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells. | | | | |

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X slots as defined in Table 4.5.2.2.5-2.

Table 4.5.2.2.5-2: Interruption length X at transition between active and non-active during DRX

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X |
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |

The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor’s Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.2.3.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

4.5.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in NR.

4.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.3.

4.5.2.3.4 Test description

4.5.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.2.3.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.2.3.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.2.3.4.1-1: Supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Config | Description |
| 4.5.2.3-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.3-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.3-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4.5.2.3-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.3-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.3-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | |

Table 4.5.2.3.4.1-1A: Supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 4.5.2.3-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.2.3-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.2.3-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.3.4.1-2.

Table 4.5.2.3.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.3.4.1-3.

2. Message contents are defined in clause 4.5.2.3.4.3.

3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.3.4.1-3: General test parameters for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell 2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

4.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell.. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.3.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.3.5-1 and Table 4.5.2.3.5-1A. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- X = 1 for inter-band EN-DC, and X = 3 for intra-band EN-DC.7. If no longer than X consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.3-1 and 4.5.2.3-4,

- X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length.

Note: UE expects that the SS won't use k1 = 3 for test configuration 4.5.2.3-1 and 4.5.2.3-4.

- For test configuration other than 4.5.2.3-1 and 4.5.2.3-4,

- X = interruption length.

- interruption length is given in Table 4.5.2.3.5-2 for inter-band case and in Table 4.5.2.3.5-3 for intra-band case.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK", "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.2.3.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition Deactivated SCell;  Table H.3.1-4 with A3-offset = 15 |
| Specific message contents exceptions for Test Configuration 4.5.2.3-1, 4.5.2.3-2, 4.5.2.3-4 and 4.5.2.3-5 | Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.5.2.3-3 and 4.5.2.3-6 | Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.2.3.4.3-2: *RRCReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR\_MEAS and SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration ::= SEQUENCE { |  |  |  | |
| measConfig | MeasConfig-DEFAULT | Measurements configuration | NR\_MEAS | |
| nonCriticalExtension SEQUENCE { |  |  |  | |
| masterCellGroup | CellGroupConfig-SCell(n) | n is number of SCC to be added | SCell\_add | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.2.3.4.3-3: ServingCellConfig (Cell 3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 |  |
| } |  |  |  |

4.5.2.3.5 Test requirement

Table 4.5.2.3.5-1 and Table 4.5.2.3.5-1A defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations for NR PSCell and SCell.

Table 4.5.2.3.5-1: NR cell specific test parameters for NR PSCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

| Parameter | | Unit | Cell 2 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | |  | Note 8 |
| BWoccupied | Config 1,2,4,5 | RB | 52 Note 6 |
| Config 3,6 | 106 Note 7 |
| Initial DL BWP Configuration | |  | DLBWP.0.1 |
| Dedicated DL BWP Configuration | |  | DLBWP.1.1 |
| Initial UL BWP Configuration | |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR 2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR 2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 6 |
| Config 3,6 |  | OP.1 Note 7 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 3 for intra-band EN-DC,  33 for inter-band EN-DC |
| Time offset to Cell2 Note 5 | | μs | - |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.  NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table 4.5.2.3.5-1A: NR cell specific test parameters for NR SCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

| Parameter | | Unit | Cell 3 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
| ConfigSCell 3 | TDDConf.2.1 |
| BWchannel | |  | Note 8 |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 6 |
| ConfigSCell 3 | 106 Note 7 |
| Initial DL BWP Configuration | |  | DLBWP.0.1 |
| Dedicated DL BWP Configuration | |  | DLBWP.1.1 |
| Initial UL BWP Configuration | |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | |  | N/A |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR 2.1 TDD |
| PDCCH CORESET parameters | ConfigSCell 1 |  | CCR.1.1 FDD |
| ConfigSCell 2 | CCR.1.1 TDD |
| ConfigSCell 3 | CCR.2.1 TDD |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
| ConfigSCell 2 | TRS.1.1 TDD |
| ConfigSCell 3 | TRS.1.2 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 6 |
| ConfigSCell 3 | OP.1 Note 7 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
| ConfigSCell 3 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 3 + Time offset to Cell2 for intra-band EN-DC,  33 + Time offset to Cell2 for inter-band EN-DC |
| Time offset to Cell2 Note 5 | | μs | 3 |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.  NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-2.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-3.

Table 4.5.2.3.5-2: Interruption duration if the NR PSCell is not  
in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

Table 4.5.2.3.5-3: Interruption duration if the NR PSCell is  
in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 0 | 1 | 2+SMTC duration |
| 1 | 0.5 | 2+SMTC duration |

For synchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 1 subframe.

For synchronous intra-band EN-DC, the UE is only allowed to cause an interruption on E-UTRA PCell no earlier than 1 subframe before an SMTC and no later than 1 subframe after the SMTC. The interruption on E-UTRA PCell shall not exceed SMTC duration + 2 subframes.

The rate of correct events observed during repeated tests shall be at least 90 %.

#### 4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor’s Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.2.4.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC

4.5.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in NR.

4.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.4.

4.5.2.4.4 Test description

4.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.2.4.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.2.4.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.2.4.4.1-1: Supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.2.4-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.4-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.4-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4.5.2.4-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.4-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.4-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Table 4.5.2.4.4.1-1A: Supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.4.4.1-2.

Table 4.5.2.4.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.4.4.1-3.

2. Message contents are defined in clause 4.5.2.4.4.3.

3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.4.4.1-3: General test parameters for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell 2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

4.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell.. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.4.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.4.5-1 and Table 4.5.2.4.5-1A. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.4-1, 4.5.2.4-2 and 4.5.2.4-3, X = 3;

- For test configuration 4.5.2.4-4, 4.5.2.4-5 and 4.5.2.4-6, X = 2;

7. If no longer than X consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.4-1 and 4.5.2.4-4,

- X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length

Note: UE expects that the SS won't use k1 = 3 for test configuration 4.5.2.4-1 and 4.5.2.4-4.

- For test configuration other than 4.5.2.4-1 and 4.5.2.4-4,

- X = interruption length.

- Interruption length is given in Table 4.5.2.4.5-2 for inter-band case and in Table 4.5.2.4.5-3 for intra-band case.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 4.5.2.4.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition Deactivated SCell;  Table H.3.1-4 with A3-offset = 15 |
| Specific message contents exceptions for Test Configuration 4.5.2.4-1, 4.5.2.4-2, 4.5.2.4 -4 and 4.5.2.4-5 | Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.5.2.4-3 and 4.5.2.4-6 | Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.2.4.4.3-2: *RRCReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR\_MEAS and SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration ::= SEQUENCE { |  |  |  | |
| measConfig | MeasConfig-DEFAULT | Measurements configuration | NR\_MEAS | |
| nonCriticalExtension SEQUENCE { |  |  |  | |
| masterCellGroup | CellGroupConfig-SCell(n) | n is number of SCC to be added | SCell\_add | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.2.4.4.3-3: ServingCellConfig (Cell 3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 |  |
| } |  |  |  |

4.5.2.4.5 Test requirement

Table 4.5.2.4.5-1 and Table 4.5.2.4.5-1A defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations for NR PSCell and NR SCell.

Table 4.5.2.4.5-1: NR cell specific test parameters for NR PSCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

| Parameter | | Unit | Cell 2 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | |  | Note 8 |
| BWoccupied | Config 1,2,4,5 | RB | 52 Note 6 |
| Config 3,6 | 106 Note 7 |
| Initial DL BWP Configuration | |  | DLBWP.0.1 |
| Dedicated DL BWP Configuration | |  | DLBWP.1.1 |
| Initial UL BWP Configuration | |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR 2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR 2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 6 |
| Config 3,6 |  | OP.1 Note 7 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | μs | 500 |
| Config 3,6 | 250 |
| Time offset to Cell2 Note 5 | | μs | N/A |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.  NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table 4.5.2.4.5-1: NR cell specific test parameters for NR SCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

| Parameter | | Unit | Cell 3 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
| ConfigSCell 3 | TDDConf.2.1 |
| BWchannel | |  | Note 8 |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 6 |
| ConfigSCell 3 | 106 Note 7 |
| Initial DL BWP Configuration | |  | DLBWP.0.1 |
| Dedicated DL BWP Configuration | |  | DLBWP.1.1 |
| Initial UL BWP Configuration | |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | |  | N/A |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR 2.1 TDD |
| PDCCH CORESET parameters | ConfigSCell 1 |  | CCR.1.1 FDD |
| ConfigSCell 2 | CCR.1.1 TDD |
| ConfigSCell 3 | CCR.2.1 TDD |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
| ConfigSCell 2 | TRS.1.1 TDD |
| ConfigSCell 3 | TRS.1.2 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 6 |
| ConfigSCell 3 | OP.1 Note 7 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
| ConfigSCell 3 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | ConfigSCell 1,2 | μs | 500 + Time offset to Cell2 |
| ConfigSCell 3 | 250 + Time offset to Cell2 |
| Time offset to Cell2 Note 5 | | μs | 3 |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.  NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-2.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-3.

Table 4.5.2.4.5-2: Interruption duration if the NR PSCell is not  
in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

Table 4.5.2.4.5-3: Interruption duration if the NR PSCell is  
in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 0 | 1 | 2+SMTC duration |
| 1 | 0.5 | 2+SMTC duration |

For asynchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 2 subframe.

The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

4.5.2.5.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

4.5.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in E-UTRA.

4.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.5.

4.5.2.5.4 Test description

4.5.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.5.4.1-1.

Table 4.5.2.5.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| LTE PCell + NR PSCell Note 2 |
| 4.5.2.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.5.4.1-2 and Table 4.5.2.5.4.1-3.

Table 4.5.2.5.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.5.4.1-3.

2. Message contents are defined in clause 4.5.2.5.4.3.

3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to Table A.6.1.1-1 except for the RF channel number 3. Cell 2 shall be configured according to clause C.1.1 and C.1.2.

Table 4.5.2.5.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2. 3 | Two E-UTRAN RF channels and one NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

4.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A.

4. Set the parameters according to T1 in Tables 4.5.2.5.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.5-1, 4.5.2.5-2 and 4.5.2.5-3,

- X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 9.

- For test configuration 4.5.2.5-4, 4.5.2.5-5 and 4.5.2.5-6,

- X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 5.

7. If no longer than Z consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX".

- For test configuration 4.5.2.5-1 and 4.5.2.1-4,

- Z = interruption length+k1 if k1 ≤ interruption length, otherwise Z = interruption length

- For test configuration other than 4.5.2.5-1 and 4.5.2.5-4,

- Z = interruption length.

- Interruption length is given by "Interruption length X" column in Table 4.5.2.5.5-2 for inter-band case and by "Interruption length Y" column in Table 4.5.2.5.5-2 for intra-band case.

7a. The SS shall transmit *RRCConnectionReconfiguration* according to Table 4.5.2.5.4.3-4 to release the E-UTRAN SCell. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.2.5.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-10 with A3-offset = 15 |

Table 4.5.2.5.4.3-2: Void

Table 4.5.2.5.4.3-3: *RRCConnectionReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 4.6.1-8, condition SCell\_AddMod | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE{ |  |  |  |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { |  |  |  |
| measConfig | MeasConfig-DEFAULT | Table H.3.4-4 | E-UTRA\_Deactivated\_SCell AND  GAPLESS |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.2.5.4.3-4: *RRCConnectionReconfiguration*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Derivation Path: 36.508 Table 4.6.1-8 | | | | | | |
| Information Element | | | Value/remark | | Comment | | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | |  | |  | |  |
| criticalExtensions CHOICE { | | |  | |  | |  |
| c1 CHOICE{ | | |  | |  | |  |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | |  | |  | |  |
| nonCriticalExtension SEQUENCE { | | |  | | RRCConnectionReconfiguration-v890-IEs | |  |
| nonCriticalExtension SEQUENCE { |  | | RRCConnectionReconfiguration-v920-IEs | |  | |
| nonCriticalExtension SEQUENCE { |  | | RRCConnectionReconfiguration-v1020-IEs | |  | |
| sCellToReleaseList-r10 SEQUENCE (SIZE (1)) OF SCellToReleaseMod-r10 { |  | |  | |  | |
| SCellToReleaseMod-r10[1] | PhysCellId of Cell 3 | |  | |  | |
| } |  | |  | |  | |
| } |  | |  | |  | |
| } |  | |  | |  | |
| } | |  | |  | |  | |
| } | |  | |  | |  | |
| } | |  | |  | |  | |
| } | |  | |  | |  | |
| } | |  | |  | |  | |

4.5.2.5.5 Test requirement

Table 4.5.2.5.5-1 defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

Table 4.5.2.5.5-1: NR cell specific test parameters for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

| Parameter | | Unit | Cell 2 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 |
| Config 2,5 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.1 |
| Config 2,5 | DLBWP.0.1 |
| Config 3,6 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 | DLBWP.1.1 |
| Config 3,6 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 | ULBWP.0.1 |
| Config 3,6 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 | ULBWP.1.1 |
| Config 3,6 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
|  |  |  |  |
|  |  |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 3 for intra-band EN-DC,  33 for inter-band EN-DC |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.  NOTE 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12. | | | |

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed X defined in Table 4.5.2.5.5-2 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table Table 4.5.2.5.5-2 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

Table 4.5.2.5.5-2: Interruption length X and Y at measurements on deactivated E-UTRA SCC

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X (slot) | Interruption length Y (slot) |
| 0 | 1 | 1 | 1+SMTC duration |
| 1 | 0.5 | 1 | 1+SMTC duration |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

The rate of correct events observed during repeated tests shall be at least 90 %.

#### 4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

4.5.2.6.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

4.5.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in E-UTRA.

4.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.6.

4.5.2.6.4 Test description

4.5.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.6.4.1-1.

Table 4.5.2.6.4.1-1: Supported test configurations for EN-DC FR1 interruptions  
during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

|  |  |
| --- | --- |
| Configuration | Description |
| LTE PCell + NR PSCell Note 2 |
| 4.5.2.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.6.4.1-2.

Table 4.5.2.6.4.1-2: Initial conditions for EN-DC FR1 interruptions  
during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.6.4.1-3.

2. Message contents are defined in clause 4.5.2.6.4.3.

3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E‑UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to Table A.6.1.1-1 except for the RF channel number 3. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.6.4.1-3: General test parameters for EN-DC FR1 interruptions  
during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | Two E-UTRAN RF channels and one NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell 2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

4.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A.

4. Set the parameters according to T1 in Table 4.5.2.6.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.6-1, 4.5.2.6-2 and 4.5.2.6-3,

- X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 9.

- For test configuration 4.5.2.6-4, 4.5.2.6-5 and 4.5.2.6-6,

- X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 5.

7. If no longer than Xconsecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.6-1 and 4.5.2.6-4,

- Z = interruption length+k1 if k1 ≤ interruption length, otherwise Z = interruption length

- For test configuration other than 4.5.2.6-1 and 4.5.2.6-4,

- Z = interruption length.

- Interruption length is given by Table 4.5.2.6.5-2 for inter-band case and Table 4.5.2.6.5-3 for intra-band case.

7a. The SS shall transmit *RRCConnectionReconfiguration* message with condition SCell\_Rel according to 4.5.2.6.4.3-4 to release E-UTRA SCell. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 4.5.2.6.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-10 with A3-offset = 15 |

Table 4.5.2.6.4.3-2: Void

Table 4.5.2.6.4.3-3: *RRCConnectionReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 4.6.1-8, condition SCell\_AddMod | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE{ |  |  |  |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { |  |  |  |
| measConfig | MeasConfig-DEFAULT | Table H.3.4-4 | E-UTRA\_Deactivated\_SCell AND  GAPLESS |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.2.6.4.3-4: *RRCConnectionReconfiguration* in step 7a: SCell release

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 4.6.1-8 | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCConnectionReconfiguration ::= SEQUENCE { |  |  |  | |
| sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE { | 1 entry |  |  | |
| sCellIndex-r10[1] | Cell Index of Cell 3 |  |  | |
| } |  |  |  | |

4.5.2.6.5 Test requirement

Table 4.5.2.6.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

Table 4.5.2.6.5-1: NR cell specific test parameters for EN-DC FR1 interruptions  
during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

| Parameter | | | Unit | Cell 2 |
| --- | --- | --- | --- | --- |
| Frequency Range | | |  | FR1 |
| Duplex mode | Config 1,4 | |  | FDD |
| Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | |  | Not Applicable |
| Config 2,5 | | TDDConf.1.1 |
| Config 3,6 | | TDDConf.2.1 |
| BWchannel | Config 1,4 | | MHz | 10: NRB,c = 52 |
| Config 2,5 | | 10: NRB,c = 52 |
| Config 3,6 | | 40: NRB,c = 106 |
| Initial DL BWP Configuration | Config 1,4 | |  | DLBWP.0.1 |
| Config 2,5 | | DLBWP.0.1 |
| Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | |  | DLBWP.1.1 |
| Config 2,5 | | DLBWP.1.1 |
| Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | |  | ULBWP.0.1 |
| Config 2,5 | | ULBWP.0.1 |
| Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | |  | ULBWP.1.1 |
| Config 2,5 | | ULBWP.1.1 |
| Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | |  | SR.1.1 FDD |
| Config 2,5 | | SR.1.1 TDD |
| Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | |  | CR.1.1 FDD |
| Config 2,5 | | CR.1.1 TDD |
| Config 3,6 | | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | |  | CCR.1.1 FDD |
| Config 2,5 | | CCR.1.1 TDD |
| Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | |  | TRS.1.1 FDD |
| Config 2,5 | | TRS.1.1 TDD |
| Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | | |  | OP.1 |
| SMTC Configuration | | |  | SMTC.1 |
| TCI state | | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | |  | SSB.1 FR1 |
| Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| NocNote 2 | | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | | dBm/15 kHz | -87 |
| Ês/Iot | | | dB | 17 |
| Ês/Noc | | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -58.96 |
| Config 3,6 | | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1Note 4 | | Config 1,2,4,5 | μs | 500 | |
| Config 3,6 | 250 | |
| Propagation Condition | | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells. | | | | |

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell . Each interruption on E-UTRAN PCell and NR PSCell shall not exceed the value defined in Table 4.5.2.6.5-2 and Table 4.5.2.6.5-3.

Table 4.5.2.6.5-2: Interruption duration if the NR PSCell is not  
in the same band as the E-UTRAN deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |

Table 4.5.2.6.5-3: Interruption duration if the NR PSCell is  
in the same band as the E-UTRAN deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.2.7

#### 4.5.2.8 EN-DC FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

- TT analysis is missing.

- Test Procedure is FFS.

- Test applicability needs to be updated

- Cell mapping is missing in Annex E

4.5.2.8.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

4.5.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in NR.

4.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.8.

4.5.2.8.4 Test description

4.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.8.4.1-1.

Table 4.5.2.8.4.1-1: Supported test configurations for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

|  |  |
| --- | --- |
| Configuration | Description |
| LTE PCell + NR PSCell Note 2 |
| 4.5.2.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.8.4.1-2.

Table 4.5.2.8.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.8.4.1-3.

2. Message contents are defined in clause 4.5.2.8.4.3.

3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 Is E‑UTRAN PCell, Cell2 is NR FR1 PSCell and Cell 3 is NR activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.8.4.1-3: General test parameters for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | Configured PSCell on NR RF channel number 2. |
| Configured SCell |  | Cell3 | Configured activated secondary cell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3. |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Filter coefficient |  | 0 | L3 filtering is not used |
| T1 | s | 5 |  |
| T2 | ms | 40 | UE shall perform SRS switching during T2 |

4.5.2.8.4.2 Test procedure

TBD

4.5.2.8.4.3 Message contents

TBD

4.5.2.8.5 Test requirement

Table 4.5.2.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 4.5.2.8.5-1: NR cell specific test parameters for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell2 | Cell3 |
| Frequency Range | |  | FR1 | FR1 |
| Duplex mode | Config 1,4 |  | FDD | TDD |
| Config 2,3,5,6 |  | TDD | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable | [TDDConfig.1.2] |
| Config 2,5 | [TDDConf.1.2] | [TDDConfig.1.2] |
| Config 3,6 | [TDDConf.2.3] | [TDDConfig.2.3] |
| BWchannel | Config 1,2,4,5 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| DL Initial BWP configuration | Config 1-6 |  | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1-6 |  | DLBWP.1.1 | DLBWP.1.1 |
| UL Initial BWP configuration | Config 1-6 |  | ULBWP.0.1 | - |
| UL dedicated BWP configuration | Config 1-6 |  | ULBWP.1.1 | - |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | SR.1.1 TDD |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | CR.1.1 TDD |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.1.1 FDD | CCR.1.1 TDD |
| Config 2,5 |  | CCR.1.1 TDD | CCR.1.1 TDD |
| Config 3,6 |  | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | TRS.1.1 TDD |
| Config 2,5 |  | TRS.1.1 TDD | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD | TRS.1.2 TDD |
| SMTC configuration | |  | SMTC.1 | SMTC.1 |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | SSB.1 FR1 |
| Config 3,6 |  | SSB.2 FR1 | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | 15 kHz |
| Config 3,6 | 30 kHz | 30 kHz |
| SRS Configuration | Config 1,2,4,5 | kHz | - | SRS.1 TDD |
|  | Config 3,6 |  | - | SRS.2 TDD |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | - |
| Config 3,6 | 30 kHz | - |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | dBm/15kHz | -104 | -104 |
| Note2 | Config 1,2,4,5 | dBm/SCS | -104 | -104 |
| Config 3,6 | -101 | -101 |
| SS-RSRPNote3 | Config 1,2,4,5 | dBm/SCS | -87 | -87 |
| Config 3,6 | -84 | -84 |
|  | | dB | 17 | 17 |
|  | | dB | 17 | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 | -52.86 |
| Time offset to Cell1 Note 4 | | μs | - | 3 |
| Propagation condition | | - | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | |

During the time duration T2, the interruption on NR PSCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table 4.5.2.8.5-2 dependent on the applied SRS carrier switching time.

Table 4.5.2.8.5-2: Interruption length on NR active serving cells at NR SRS carrier switching (slot)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NR Slot length | SRS carrier | Interruption length X1 (slots) | |
|  | (ms) of victim cell | switching time (us)Note 1 | Sub carrier spacing for aggressor cell (kHz) | |
|  |  |  | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
|  |  | 300, 500 | 2 | 2 |
|  |  | 900 | 3 | 3 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
|  |  | 300, 500 | 3 | 3 |
|  |  | 900 | 4 | 4 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

During the time duration T2, the interruption on E-UTRAN PCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table 4.5.2.8.5-3 dependent on the applied SRS carrier switching time.

Table 4.5.2.8.5-3: Interruption length on E-UTRAN active serving cells at NR SRS carrier switching

|  |  |
| --- | --- |
| NR SRS carrier switching time (us)note1 | Interruption length X1 (subframes) |
|
| ≤500 | 2 |
| 900 | 3 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | |

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

#### 4.5.2.9 EN-DC FR1 interruptions at E-UTRA SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

- TT analysis is missing.

- Test Procedure is FFS.

- Test applicability needs to be updated

- Cell mapping is missing in Annex E

4.5.2.9.1 Test purpose

The purpose of this test is to verify the active serving cell in SCG interruptions during carrier-based switching to one PUSCH-less SCCs from a CC with PUSCH, when a UE needs to transmit aperiodic SRS.

4.5.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2DL CA in E-UTRA.

4.5.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.9.

4.5.2.9.4 Test description

4.5.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.9.4.1-1.

Table 4.5.2.9.4.1-1: Supported test configurations for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| LTE PCell + NR PSCell Note 2 |
| 4.5.2.9-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.9-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.9-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.9-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.9-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.9-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.9.4.1-2.

Table 4.5.2.9.4.1-2: Initial conditions for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.2.9.4.1-3 and SRS parameters are given in Table 4.5.2.9.4.1-4.

2. Message contents are defined in clause 4.5.2.9.4.3.

3. There are two E-UTRA carriers and one NR carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 is E‑UTRA PCell, Cell2 is NR FR1 PSCell and Cell 3 is E-UTRA activated SCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.9.4.1-3: General test parameters for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell |  | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

Table 4.5.2.9.4.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| srsBandwidthConfiguration | bw5 |  |
| srsSubframeConfiguration | Sc8 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE |  |
| srsMaxUpPTS | N/A | Not applicable for E-UTRAN FDD |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 |
| frequencyDomainPosition | 0 |  |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigurationIndex | 47 | SRS periodicity of 40ms. |
| transmissionComb | 0 |  |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. | | |

4.5.2.9.4.2 Test procedure

TBD

4.5.2.9.4.3 Message contents

TBD

4.5.2.9.5 Test requirement

Table 4.5.2.9.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching.

Table 4.5.2.9.5-1: NR cell specific test parameters for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
|  | Config 2,3,5,6 |  | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
|  | Config 2,5 |  | [TDDConf.1.2] |
|  | Config 3,6 |  | [TDDConf.2.3] |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 |
|  | Config 2,5 |  | 10: NRB,c = 52 |
|  | Config 3,6 |  | 40: NRB,c = 106 |
| Initial DL BWP | Config 1,4 |  | DLBWP.0.1 |
| Configuration | Config 2,5 |  | DLBWP.0.1 |
|  | Config 3,6 |  | DLBWP.0.1 |
| Dedicated DL BWP | Config 1,4 |  | DLBWP.1.1 |
| Configuration | Config 2,5 |  | DLBWP.1.1 |
|  | Config 3,6 |  | DLBWP.1.1 |
| Initial UL BWP | Config 1,4 |  | ULBWP.0.1 |
| Configuration | Config 2,5 |  | ULBWP.0.1 |
|  | Config 3,6 |  | ULBWP.0.1 |
| Dedicated UL BWP | Config 1,4 |  | ULBWP.1.1 |
| Configuration | Config 2,5 |  | ULBWP.1.1 |
|  | Config 3,6 |  | ULBWP.1.1 |
| PDSCH Reference | Config 1,4 |  | SR.1.1 FDD |
| measurement channel | Config 2,5 |  | SR.1.1 TDD |
|  | Config 3,6 |  | SR.2.1 TDD |
| RMSI CORESET | Config 1,4 |  | CR.1.1 FDD |
| parameters | Config 2,5 |  | CR.1.1 TDD |
|  | Config 3,6 |  | CR.2.1 TDD |
| PDCCH CORESET | Config 1,4 |  | CCR.1.1 FDD |
| parameters | Config 2,5 |  | CCR.1.1 TDD |
|  | Config 3,6 |  | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
|  | Config 2,5 |  | TRS.1.1 TDD |
|  | Config 3,6 |  | TRS.1.2 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
|  | Config 3,6 |  | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | |  |  |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
|  | Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 33 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells | | | |

The UE shall be continuously scheduled in NR PSCell throughout the test and during the time duration T2, Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.9.2-1.

Table 4.5.2.9.5-2: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching

|  |  |  |
| --- | --- | --- |
|  | NR Slot | Interruption length X3 |
|  | length (ms) | (slots) |
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

### 4.5.3 SCell activation and deactivation delay

#### 4.5.3.0 Minimum conformance requirements

4.5.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot , where:

THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in 38.213 [8].

Tactivation\_time is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, Tactivation\_time is:

- TFirstSSB + 5ms, if the SCell measurement cycle is equal to or smaller than 160ms.

- TFirstSSB\_MAX + Trs + 5ms, if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, Tactivation\_time is:

- TFirstSSB\_MAX + TSMTC\_MAX + 2\*Trs + 5ms.

If the SCell being activated belongs to FR2, and if there is at least one active serving cell on that FR2 band, then Tactivation\_time is TFirstSSB + 5ms provided:

- The UE is provided with SMTC for the target SCell, and

- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in TS 38.133 [6] clause 3.6.3.

- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, Tactivation\_time is 3ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then Tactivation\_time is:

- 3 ms + max(Tuncertainty\_MAC +TFineTiming + 2ms, Tuncertainty\_SP), where Tuncertainty\_MAC=0 and Tuncertainty\_SP=0, if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then Tactivation\_time is:

- max(Tuncertainty\_MAC + 5ms + TFineTiming, Tuncertainty\_RRC + TRRC\_delay-THARQ), where Tuncertainty\_MAC=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 6ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + THARQ + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP)

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max ((THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)).

Where,

TSMTC\_MAX:

- In FR1, in case of intra-band SCell activation, TSMTC\_MAX is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, TSMTC\_MAX is the SMTC periodicity of SCell being activated.

- In FR2, TSMTC\_MAX is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- TSMTC\_MAX is bounded to a minimum value of 10ms.

Trs is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves Trs is applied with Trs = 5ms assuming the SSB transmission periodicity is 5ms. There is no requirements if the SSB transmission periodicity is not 5ms.

TFirstSSB: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after n + .

TFirstSSB\_MAX: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot n + , further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.

- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

TFineTiming is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state

TL1-RSRP, measure is L1-RSRP measurement delay TL1-RSRP\_Measurement\_Period\_SSB msor TL1-RSRP\_Measurement\_Period\_CSI-RS based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

TL1-RSRP,report is delay of acquiring CSI reporting resources.

Tuncertainty\_MAC is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

Tuncertainty\_SP is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

Tuncertainty\_RRC is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

TRRC\_delay is the RRC procedure delay as specified in [13].

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.TCSI\_reporting is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5 measCycleSCell, 5 DRX cycles) for FR1 before the reception of the SCell activation command:

- the UE has sent a valid measurement report for the SCell being activated and

- the SSB measured remains detectable according to the cell identification conditions specified in TS 38.133 [6] section 9.2 and 9.3.

- the SSB measured during the period equal to max(5 measCycleSCell, 5 DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] section 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

The requirements for FR1 unknown SCell activation specified in this clause apply when one of the following conditions is met

- ‘ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or

- ‘ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):

- the UE has sent a valid L3-RSRP measurement report with SSB index

- SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation

- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*prior to the activation command, TSMTC\_Scell follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. TSMTC\_MAX follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133[6] clause 8.2, shall not occur before slot n+1+ and not occur after slot slot n+1+, where NR slot length is with respect to the numerology used in the SCell being activated, and TX is:

- TFirstSSB, for any scenario where Tactivation\_time includes TFirstSSB;

- TFirstSSB\_MAX, for any scenario where Tactivation\_time includes TFirstSSB\_MAX;

- Tuncertainty\_MAC +TFineTiming, for any scenario where Tactivation\_time includes TFineTiming.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this clause and requriements on interruption due to SCell activation in clause 8.2 apply provided that the SSB of the to-be-activated SCell is within the first active DL BWP of the SCell.Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot *n +*.

The starting point of an interruption on SpCell or any activated SCell in the same cell group as SCell being deactivated for NR standalone, EN-DC, NE-DC or NR-DC mode specified in clause 8.2 shall not occur before slot n+1+ and not occur after slot n+1+. where NR slot length is with respect to the numerology used in the SCell being deactivated.



Upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot *n +*. The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133 [6] clause 8.2, shall not occur before slot n+1 and not occur after slot n+1+, where NR slot length is with respect to the numerology used in the SCell being deactivated.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.

#### 4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

Editor’s Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.1.

4.5.3.1.4 Test description

4.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.1.4.1-1. Supported test configurations for NR SCell are shown in table Table 4.5.3.1.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.3.1.4.1-1: supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Config | Description |
| 4.5.3.1-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.3.1-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.3.1-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4.5.3.1-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.3.1-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.3.1-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | |

Table 4.5.3.1.4.1-1A: supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.1.4.1-2 and Table 4.5.3.1.4.1-3.

Table 4.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.1.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.1 |
| Exceptions to connection diagram | N/A | |  |

Table 4.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case,  
160ms SCell measurement cycle

| **Parameter** | **Unit** | **Value** | **Comment** |
| --- | --- | --- | --- |
| RF Channel Number |  | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on E-UTRAN RF channel number 1.  As specified in section A.3.7.2.1 of TS38.133 [6] |
| Active PSCell |  | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell3 timing offset to cell2 | μs | 0 |  |
| Time alignment error between cell3 and cell2 | μs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| THARQ | ms | k1\*NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] |
| TCSI\_Reporting | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| K | slot |  | As specified in section 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.

4.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot . The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell or PSCell interruption due to activation of SCell shall occur in the slot to . Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and is the interruption length given in TS 36.133 [23] section 7.32.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot . The starting point of any PSCell interruption due to the deactivation shall occur in the slot to . The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 4.5.3.1.5**-**1 and A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot ,

- or slot if the slot was subject to interruption,

- or the next CSI report occasion if there is no CSI report occasion in slots or ,

- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot ,

- or slot if slot was subject to interruption,

- or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot , or slot if was subject to interruption,

- and DTX is not observed by the SS outside the slot to up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell during SCell deactivation.

- If the last CSI report is received by the SS earlier than or equal to slot

- and DTX is not observed by the SS outside the slot to up to the end of T3,

- Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.  
If all events pass, the test passes. If one event fails, the test fails.

4.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL\_CSI\_ON\_SPCELL with the following exceptions:

Table 4.5.3.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

Table 4.5.3.1.4.3-2: *RRCReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC\_MEAS and EN-DC\_SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration ::= SEQUENCE { |  |  |  | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.1.4.3-5 |  | |
| measConfig | MeasConfig | Table 4.5.3.1.4.3-2A |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.3.1.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries |  |  |
| measObject[2] CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR for SCell | entry 2  Table 4.5.3.1.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | ReportConfigId |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 4.5.3.1.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.1.4.3-3: MeasObjectNR for SCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| measCycleSCell-v1530 | sf160 |  |  |
| } |  |  |  |

Table 4.5.3.1.4.3-4: ReportConfigNR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-4 | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| eventTriggered SEQUENCE { |  |  |  |
| eventId CHOICE { |  |  |  |
| eventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -30 | To ensure reporting can always be triggered |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.1.4.3-5: CellGroupConfig-SCell (Table 4.5.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex of NR SpCell |  |  |
| reconfigurationWithSync | Not present |  |  |
| rlf-TimersAndConstants | Not present |  |  |
| rlmInSyncOutOfSyncThreshold | Not present |  |  |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.1.4.3-6 |  |
| } |  |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.1.4.3-7 |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.1.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| servingCellMO | 1 |  |  |
| } |  |  |  |

Table 4.5.3.1.4.3-7: ServingCellConfig-SCell (Table 4.5.3.1.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No\_UL | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| servingCellMO | 2 |  |  |
| } |  |  |  |

4.5.3.1.5 Test requirement

Table 4.5.3.1.5-1 and Table 4.5.3.1.5-1A defines the primary level settings including test tolerances for all tests.

Table 4.5.3.1.5-1: Cell specific test parameters for for NR PSCell known FR1 SCell activation case,  
160ms SCell measurement cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | |
| T1 | T2 | T3 |
| SSB ARFCN | |  | freq1 | | |
| Duplex mode | Config 1,4 |  | FDD | | |
| Config 2,3,5,6 | TDD | | |
| TDD configuration | Config 1,4 |  | Not Applicable | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | | MHz | Note 7 | | |
| BWoccupied | Config 1,2,4,5 | RB | 52 Note 5 | | |
|  | Config 3,6 |  | 106 Note 6 | | |
| DL initial BWP configuration | |  | DLBWP.0.1 | | |
| DL dedicated BWP configuration | |  | DLBWP.1.1 | | |
| UL initial BWP configuration | |  | ULBWP.0.1 | | |
| UL dedicated BWP configuration | |  | ULBWP.1.1 | | |
| DRX Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.1.1 FDD | | |
| Config 2,5 |  | CCR.1.1 TDD | | |
| Config 3,6 |  | CCR.2.1 TDD | | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | | |
| Config 2,5 |  | TRS.1.1 TDD | | |
| Config 3,6 |  | TRS.1.2 TDD | | |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 5 | | |
|  | Config 3,6 |  | OP.1 Note 6 | | |
| SMTC configuration | |  | SMTC.1 | | |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | | |
| Config 3,6 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting | Config 1,4 |  | CSI-RS.1.1 FDD | | |
| Config 2,5 |  | CSI-RS.1.1 TDD | | |
| Config 3,6 |  | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | | |
| Config 3,6 | 30 | | |
| reportConfigType | Config 1-6 |  | periodic | | |
| reportQuantity | Config 1-6 |  | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | | |
|  | Config 3,6 |  | 10 | | |
| CSI reporting offset | Config 1,2,4,5 | slot | 2 | | |
|  | Config 3,6 |  | 4 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | | dBm/15kHz | -104 | | |
| Note2 | Config 1,2,4,5 | dBm/SCS | -104 | | |
| Config 3,6 | -101 | | |
|  | | dB | 17 | | |
|  | | dB | 17 | | |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | | |
| Config 3,6 | -84 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87 | | |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 | | |
| Config 3,6 | dBm/38.16MHz | -52.87 | | |
| Propagation condition | | - | AWGN | | |
| Correlation Matrix and Antenna configuration | |  | 2x2 Low | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: SS-RSRP, Io and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | |

Table 4.5.3.1.5-1A: Cell specific test parameters for NR SCell for known FR1 SCell activation case,  
160ms SCell measurement cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 3 | | |
| T1 | T2 | T3 |
| SSB ARFCN | |  | freq2 | | |
| Duplex mode | ConfigSCell 1 |  | FDD | | |
| ConfigSCell 2,3 | TDD | | |
| TDD configuration | ConfigSCell 1 |  | Not Applicable | | |
| ConfigSCell 2 | TDDConf.1.1 | | |
| ConfigSCell 3 | TDDConf.2.1 | | |
| BWchannel | | MHz | Note 7 | | |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 5 | | |
|  | ConfigSCell 3 |  | 106 Note 6 | | |
| DL initial BWP configuration | |  | DLBWP.0.1 | | |
| DL dedicated BWP configuration | |  | DLBWP.1.1 | | |
| UL initial BWP configuration | |  | ULBWP.0.1 | | |
| UL dedicated BWP configuration | |  | ULBWP.1.1 | | |
| DRX Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | SR.1.1 FDD | | |
| ConfigSCell 2 | SR.1.1 TDD | | |
| ConfigSCell 3 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | ConfigSCell 1 |  | CR.1.1 FDD | | |
| ConfigSCell 2 | CR.1.1 TDD | | |
| ConfigSCell 3 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | ConfigSCell 1 |  | CCR.1.1 FDD | | |
| ConfigSCell 2 |  | CCR.1.1 TDD | | |
| ConfigSCell 3 |  | CCR.2.1 TDD | | |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD | | |
| ConfigSCell 2 |  | TRS.1.1 TDD | | |
| ConfigSCell 3 |  | TRS.1.2 TDD | | |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 5 | | |
|  | ConfigSCell 3 |  | OP.1 Note 6 | | |
| SMTC configuration | |  | SMTC.1 | | |
| SSB configuration | ConfigSCell 1,2 |  | SSB.1 FR1 | | |
| ConfigSCell 3 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting | ConfigSCell 1 |  | CSI-RS.1.1 FDD | | |
| ConfigSCell 2 |  | CSI-RS.1.1 TDD | | |
| ConfigSCell 3 |  | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | ConfigSCell 1,2 | kHz | 15 | | |
| ConfigSCell 3 | 30 | | |
| reportConfigType | |  | N/A | | |
| reportQuantity | |  | N/A | | |
| CSI reporting periodicity | | slot | N/A | | |
| CSI reporting offset | | slot | N/A | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | | dBm/15kHz | -104 | | |
| Note2 | ConfigSCell 1,2 | dBm/SCS | -104 | | |
| ConfigSCell 3 | -101 | | |
|  | | dB | 17 | | |
|  | | dB | 17 | | |
| SS-RSRPNote3 | ConfigSCell 1,2 | dBm/SCS | -87 | | |
| ConfigSCell 3 | -84 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87 | | |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 | | |
| ConfigSCell 3 | dBm/38.16MHz | -52.87 | | |
| Propagation condition | | - | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: SS-RSRP, Io and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | |

During T2 the UE shall send the first CSI report for SCell no later than the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot . UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in slot was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot .

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot , Tactivation\_time = TFirstSSB+ 5ms, as defined in TS 38.133 [6] section 8.3.

Figures 4.5.3.1.5-1 shows the deriviation of the Test procedure requreiment for DTX during T2, based on the core requirements for interruption.

Chart, timeline, waterfall chart

Description automatically generated

Figure 4.5.3.1.5-1: Procedure derivation for Activation

1) Activation command for SCell

2) ACK for MAC-CE for SCell1 activation

3) First CSI report timing (could be invalid CQI)

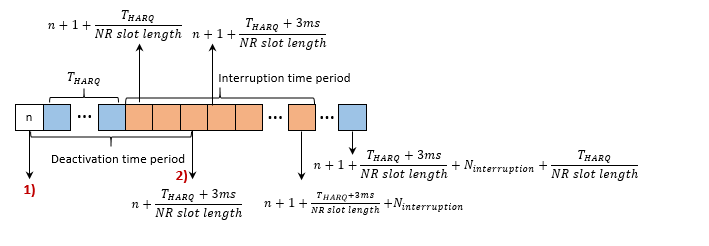
4) First non-zero CSI report transmission

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot , as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot to , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe to subframe, as defined in TS 38.133 [6] section 8.3.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot to , as defined in TS 38.133 [6] section 8.3, and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe to subframe .

Figures 4.5.3.1.5-2 shows the deriviation of the Test procedure requreiment for NR PSCell DTX during T3, based on the core requirements for interruption.

Figure 4.5.3.1.5-2: Procedure derivation for Deactivation

1) Deactivation command for SCell

2) Latest slot stop sending CSI reports for Scell

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90 %.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

#### 4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle

Editor’s Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.2.

4.5.3.2.4 Test description

4.5.3.2.4.1 Initial conditions

Same initial conditions as described in section 4.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 4.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

Table 4.5.3.2.4.1-1: Void

Table 4.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |

4.5.3.2.4.2 Test procedure

Same test procedure as described in section 4.5.3.1.4.2:

4.5.3.2.4.3 Message contents

Same message contents as described in section 4.5.3.1.4.3 with following exception:

* Table 4.5.3.1.4.3-3 is replaced by Table 4.5.3.2.4.3-1.

Table 4.5.3.2.4.3-1: MeasObjectNR for SCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| } |  |  |  |

4.5.3.2.5 Test requirement

Same test requirement as described in section 4.5.3.1.5, except Tactivation\_time will be replaced with the value TFirstSSB\_MAX + Trs + 5ms.

#### 4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX

Editor’s Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is unknown by the UE at the time of activation.

4.5.3.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.3.

4.5.3.3.4 Test description

4.5.3.3.4.1 Initial conditions

Same initial conditions as described in section 4.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 4.5.3.3.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

Table 4.5.3.3.4.1-1: Void

Table 4.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case,  
160ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| T1 | ms | 100 | During this time the PSCell shall be known and the SCell configured, but not detected. |

4.5.3.3.4.2 Test procedure

Same test procedure as described in section 4.5.3.1.4.2, except step 3and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete. The SCell (Cell 3) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCell (Cell3), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and:

* Step 3a is removed.

4.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL\_CSI\_ON\_SPCELL with the following exceptions:

Table 4.5.3.3.4.3-1: *RRCReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC\_SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration ::= SEQUENCE { |  |  |  | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.3.3.4.3-2 |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.3.3.4.3-2: CellGroupConfig (Table 4.5.3.3.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex of NR SpCell |  |  |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.3.4.3-3 |  |
| } |  |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.3.4.3-4 |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.3.4.3-3: ServingCellConfig-SpCell (Table 4.5.3.3.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

Table 4.5.3.3.4.3-4: ServingCellConfig-SCell (Table 4.5.3.3.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No\_UL | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

4.5.3.3.5 Test requirement

Same test requirement as described in section 4.5.3.1.5, except Tactivation\_time will be replaced with the value TFirstSSB\_MAX + TSMTC\_MAX + 2\*Trs + 5ms

#### 4.5.3.5 Direct SCell activation at SCell addition of known SCell in FR1

4.5.3.5.1 Test purpose

The purpose of this test is to verify that the direct SCell activation time is within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.5.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and supporting 2DL CA in NR and direct SCell activation.

4.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.5.

4.5.3.5.4 Test description

4.5.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.5.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.3.5.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.3.5.4.1-1: known FR1 direct SCell activation supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Config | Description |
| 4.5.3.5-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.3.5-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.3.5-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4.5.3.5-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.3.5-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.3.5-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | |

Table 4.5.3.5.4.1-1A: supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.5.4.1-2 and Table 4.5.3.5.4.1-3.

Table 4.5.3.5.4.1-2: Initial conditions for known FR1 SCell activation case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.5.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.1 |
| Exceptions to connection diagram | N/A | |  |

Table 4.5.3.5.4.1-3: General test parameters for known FR1 direct SCell activation

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on E-UTRAN RF channel number 1.  As specified in TS 38.133 [6] clause A.3.7.2.1 |
| Active PSCell |  | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| SCell |  | Cell 3 | Secondary cell on NR RF channel number 3 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index |  | 0 | CQI reporting for SCell every four slots. |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell3 timing offset to cell2 | ms | 0 |  |
| Time alignment error between cell3 and cell2 | ms | £ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the Cell 3 shall be known. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 |  |
| THARQ | ms | k1×NR slot length | k1 is a number of slots indicated by the PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [8] |
| TCSI\_Reporting | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | ms |  | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the known activated SCell.

4.5.3.5.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the RRC message for direct SCell activation is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The test equipment sends the RRCConnectionReconfiguration message for the activation of the SCell within time period specified in TS 38.133 [6] clause 8.3.2 for known cell definition to ensure the configured SCell is known. The NR shall be using an *RRCConnectionReconfiguration* message with parameter *sCellState* set to *activated* for the SCell (Cell 3), which causes the SCell to become configured and activated on radio channel 3 (SCC). The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot , where is the time taken for direct SCell activation as defined in TS 38.133 [6] clause 8.3.4. The UE shall start reporting CSI in PSCell in slot (m+k+TRRC\_process), where TRRC\_process is the RRC procedure delay as specified in clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay defined in clause 12 of TS 38.331 [13]. It shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot to slot , as defined in TS 38.133 [6] clause 8.3.4, where is the interruption length given in TS 38.133 [6] clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, Tx is the time to the end of the first complete the SSB burst as specified in TS 36.133 [6] clause 8.3.4, and is the interruption length given in TS 36.133 [6] clause 7.32.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Tables 4.5.3.5.5**-**1 and A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.5.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.
   1. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*
4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.
5. The UE shall start reporting CSI in PSCell in slot (m+k+TRRC\_process) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot ,

- or slot if the slot was subject to interruption,

- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot ,

- or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot

- and DTX is not observed by the SS outside the slot to up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 6.

1. When T2 expires or a fail was counted for the event "Activation" in step 5, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
2. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
3. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
4. Repeat steps 2-8 until a test verdict has been achieved.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

4.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL\_CSI\_ON\_SPCELL with the following exceptions:

Table 4.5.3.5.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

Table 4.5.3.5.4.3-2: *RRCReconfiguration* in step 3: SCell addition

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC\_MEAS and EN-DC\_SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration ::= SEQUENCE { |  |  |  | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.5.4.3-5 |  | |
| measConfig | MeasConfig | Table 4.5.3.5.4.3-2A |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.3.5.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries |  |  |
| measObject[2] CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR for SCell | entry 2  Table 4.5.3.5.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | ReportConfigId |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 4.5.3.5.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.5.4.3-3: MeasObjectNR for SCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| measCycleSCell-v1530 | sf160 |  |  |
| } |  |  |  |

Table 4.5.3.5.4.3-4: ReportConfigNR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-4 | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| eventTriggered SEQUENCE { |  |  |  |
| eventId CHOICE { |  |  |  |
| eventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -30 | To ensure reporting can always be triggered |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.5.4.3-5: CellGroupConfig-SCell (Table 4.5.3.5.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex of NR SpCell |  |  |
| reconfigurationWithSync | Not present |  |  |
| rlf-TimersAndConstants | Not present |  |  |
| rlmInSyncOutOfSyncThreshold | Not present |  |  |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.5.4.3-6 |  |
| } |  |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.5.4.3-7 |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| sCellState-r16 | activated |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.3.5.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.5.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| servingCellMO | 1 |  |  |
| } |  |  |  |

Table 4.5.3.5.4.3-7: ServingCellConfig-SCell (Table 4.5.3.5.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No\_UL | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| servingCellMO | 2 |  |  |
| } |  |  |  |

4.5.3.5.5 Test requirement

Table 4.5.3.5.5-1 and Table 4.5.3.5.5-1A defines the primary level settings including test tolerances for all tests.

Table 4.5.3.5.5-1: Cell specific test parameters for NR PSCell for known FR1 direct SCell activation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | |
|  | |  | T1 | T2 |
| SSB ARFCN | |  | freq1 | |
| Duplex mode | Config 1,4 |  | FDD | |
|  | Config 2,3,5,6 |  | TDD | |
| TDD configuration | Config 1,4 |  | Not Applicable | |
|  | Config 2,5 |  | TDDConf.1.1 | |
|  | Config 3,6 |  | TDDConf.2.1 | |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 | |
|  | Config 2,5 |  | 10: NRB,c = 52 | |
|  | Config 3,6 |  | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1,2,3,4,5,6 |  | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1,2,3,4,5,6 |  | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1,2,3,4,5,6 |  | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1,2,3,4,5,6 |  | ULBWP.1.1 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference | Config 1,4 |  | SR.1.1 FDD | |
| measurement channel | Config 2,5 |  | SR.1.1 TDD | |
|  | Config 3,6 |  | SR.2.1 TDD | |
| RMSI CORESET | Config 1,4 |  | CR.1.1 FDD | |
| Reference Channel | Config 2,5 |  | CR.1.1 TDD | |
|  | Config 3,6 |  | CR.2.1 TDD | |
| RMC CORESET | Config 1,4 |  | CCR.1.1 FDD | |
| Reference Channel | Config 2,5 |  | CCR.1.1 TDD | |
|  | Config 3,6 |  | CCR.2.1 TDD | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | |
|  | Config 2,5 |  | TRS.1.1 TDD | |
|  | Config 3,6 |  | TRS.1.2 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SMTC configuration | |  | SMTC.1 | |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | |
|  | Config 3,6 |  | SSB.2 FR1 | |
| PDSCH/PDCCH | Config 1,2,4,5 | kHz | 15 kHz | |
| subcarrier spacing | Config 3,6 |  | 30kHz | |
| CSI-RS configuration for CSI reporting | Config 1,4 |  | CSI-RS.1.1 FDD | |
| Config 2,5 |  | CSI-RS.1.1 TDD | |
| Config 3,6 |  | CSI-RS.2.1 TDD | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | |
| Config 3,6 |  | 30 | |
| reportConfigType | Config 1-6 |  | periodic | |
| reportQuantity | Config 1-6 |  | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | |
| Config 3,6 |  | 10 | |
| CSI reporting offset | Config 1,2,4,5 | slot | 2 | |
| Config 3,6 |  | 4 | |
| EPRE ratio of PSS to SSS | |  |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  | |
| Note2 | | dBm/15kHz | -104~~+TT~~ | |
| Note2 | Config 1,2,4,5 | dBm/SCS | -104~~+TT~~ | |
|  | Config 3,6 |  | -101~~+TT~~ | |
|  | | dB | 17~~+TT~~ | |
|  | | dB | 17~~+TT~~ | |
| SS-RSRPNote3 | Config 1,2,4,5 | dBm/SCS | -87~~+TT~~ | |
|  | Config 3,6 |  | -84~~+TT~~ | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87~~+TT~~ | |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | | | |

Table 4.5.3.5.5-1A: Cell specific test parameters for NR SCell for known FR1 direct SCell activation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 3 | |
|  | |  | T1 | T2 |
| SSB ARFCN | |  | freq2 | |
| Duplex mode | ConfigSCell 1 |  | FDD | |
|  | ConfigSCell 2,3 |  | TDD | |
| TDD configuration | ConfigSCell 1 |  | Not Applicable | |
|  | ConfigSCell 2 |  | TDDConf.1.1 | |
|  | ConfigSCell 3 |  | TDDConf.2.1 | |
| BWchannel | ConfigSCell 1 | MHz | 10: NRB,c = 52 | |
|  | ConfigSCell 2 |  | 10: NRB,c = 52 | |
|  | ConfigSCell 3 |  | 40: NRB,c = 106 | |
| DL initial BWP configuration | ConfigSCell 1,2,3 |  | DLBWP.0.1 | |
| DL dedicated BWP configuration | ConfigSCell 1,2,3 |  | DLBWP.1.1 | |
| UL initial BWP configuration | ConfigSCell 1,2,3 |  | ULBWP.0.1 | |
| UL dedicated BWP configuration | ConfigSCell 1,2,3 |  | ULBWP.1.1 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference | ConfigSCell 1 |  | SR.1.1 FDD | |
| measurement channel | ConfigSCell 2 |  | SR.1.1 TDD | |
|  | ConfigSCell 3 |  | SR.2.1 TDD | |
| RMSI CORESET | ConfigSCell 1 |  | CR.1.1 FDD | |
| Reference Channel | ConfigSCell 2 |  | CR.1.1 TDD | |
|  | ConfigSCell 3 |  | CR.2.1 TDD | |
| RMC CORESET | ConfigSCell 1 |  | CCR.1.1 FDD | |
| Reference Channel | ConfigSCell 2 |  | CCR.1.1 TDD | |
|  | ConfigSCell 3 |  | CCR.2.1 TDD | |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD | |
|  | ConfigSCell 2 |  | TRS.1.1 TDD | |
|  | ConfigSCell 3 |  | TRS.1.2 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SMTC configuration | |  | SMTC.1 | |
| SSB configuration | ConfigSCell 1,2 |  | SSB.1 FR1 | |
|  | ConfigSCell 3 |  | SSB.2 FR1 | |
| PDSCH/PDCCH | ConfigSCell 1,2 | kHz | 15 | |
| subcarrier spacing | ConfigSCell 3 |  | 30 | |
| CSI-RS configuration for CSI reporting | ConfigSCell 1 |  | CSI-RS.1.1 FDD | |
| ConfigSCell 2 |  | CSI-RS.1.1 TDD | |
| ConfigSCell 3 |  | CSI-RS.2.1 TDD | |
| PDSCH/PDCCH subcarrier spacing | ConfigSCell 1,2 | kHz | 15 | |
| ConfigSCell 3 | 30 | |
| reportConfigType | ConfigSCell 1-3 |  | periodic | |
| reportQuantity | ConfigSCell 1-3 |  | cri-RI-PMI-CQI | |
| CSI reporting periodicity | ConfigSCell 1,2 | slot | 5 | |
| ConfigSCell 3 | 10 | |
| CSI reporting offset | ConfigSCell 1,2 | slot | 2 | |
| ConfigSCell 3 | 4 | |
| EPRE ratio of PSS to SSS | |  |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  | |
| Note2 | | dBm/15kHz | -104~~+TT~~ | |
| Note2 | ConfigSCell 1,2 | dBm/SCS | -104~~+TT~~ | |
|  | ConfigSCell 3 |  | -101~~+TT~~ | |
|  | | dB | 17~~+TT~~ | |
|  | | dB | 17~~+TT~~ | |
| SS-RSRPNote3 | ConfigSCell 1,2 | dBm/SCS | -87~~+TT~~ | |
|  | ConfigSCell 3 |  | -84~~+TT~~ | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87~~+TT~~ | |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | | | |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k+TRRC\_process). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k+TRRC\_process) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k+TRRC\_process).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot . Ndirect = TRRC\_Process + T1 + Tactivation\_time + TCSI\_Reporting - 3ms, where TRRC\_Process = 20 ms and other components are defined in TS 38.133 [6] clause 8.3.4.

During T2 interruption of PSCell during direct SCell activation shall not happen outside the slot to , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe to subframe, as defined in TS 38.133 [6] clause 8.3.4.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.8.

All the above test requirements shall be fulfilled for the observed direct SCell activation delay to be counted as correct. The rate of correct observed direct SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot as defined in TS 38.133 [6] clause 8.3.4 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### 4.5.4 UE UL carrier RRC reconfiguration delay

#### 4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay

4.5.4.1.1 Test purpose

This test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL (SUL) carrier configuration, the UE is ready to start transmission on the newly configured carrier within the time limits specified for configuring and deconfiguring carrier. This test will verify the UE being configured or deconfigured with a SUL carrier or NR UL carrier RRC reconfiguration delay requirements in TS 38.133 clause 8.4.

4.5.4.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards. This test is applicable to UE that supports SUL.

4.5.4.1.3 Minimum conformance requirements

When the UE receives a RRC message implying NR UL or supplementary UL (SUL) carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within TUL\_carrier\_config from the end of the slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.

- TUL\_carrier\_deconfig equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

When the UE receives a RRC message implying NR UL or supplementary UL (SUL) carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within TUL\_carrier\_config from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.

- TUL\_carrier\_deconfig equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.4.1.

4.5.4.1.4 Test description

4.5.4.1.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 4.5.4.1.4.1-1.

Table 4.5.4.1.4.1-1: Supported test configurations for FR1 PSCell (Cell2) and SCell (Cell3)

| Configuration | PSCell (Cell2) | SCell (Cell3) |
| --- | --- | --- |
| 4.5.4.1-1 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-2 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-3 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-4 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-5 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-6 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-7 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-8 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-9 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.4.1.4.1-2.

Table 4.5.4.1.4.1-2: Initial conditions for EN-DC FR1 UE UL carrier RRC reconfiguration delay

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.5.4.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. Cell 3 is NR FR1 SCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The test parameters are given in Table 4.5.4.1.4.1-3 below.

4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 4.5.4.1.4.1-3: General test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay

| Parameter | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- |
| RF Channel Number |  | Config 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1, 2, 3 | Three radio channels are used for these two tests. |
| Active cell |  | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | Cell 1: E-UTRAN PCell  Cell 2: FR1 PSCell  Cell 3: FR1 SCell | E-UTRAN PCell on RF channel number 1  FR1 PSCell on RF channel number 2  FR1 SCell on RF channel number 3 |
| CP length |  | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | Normal |  |
| DRX |  | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | OFF |  |
| Measurement gap pattern Id |  | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | OFF |  |
| Filter coefficient |  | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 0 | L3 filtering is not used |
| T1 | s | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 5 |  |
| T2 | s | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 5 |  |
| T3 | s | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 5 |  |

4.5.4.1.4.2 Test procedure

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test case consists of two tests: Test 1 and Test 2.

In Test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 3 is configured to UE. At the start of T2, a supplementary uplink of Cell 3 is configured to UE through *RRCReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In Test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementary uplink on Cell 3 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Setup E-UTRAN PCell (Cell 1) according to parameters given in Table A.6.1.1-1 and setup FR1 PSCell (Cell 2) according to parameters given in Table 4.5.4.1.5-1.

3. For SCell (Cell 3), both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*.

4. For Test 1: NR uplink of Cell 3 is configured to UE during T1

4.1. During time duration T1, NR uplink of Cell 3 is configured to UE. Setup FR1 SCell (Cell 3) according to parameters given in Table 4.5.4.1.5-2.

4.2 T2 starts when a supplementary uplink of SCell (Cell 3) is configured to UE through *RRCConnectionReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration".

4.3 T3 starts when the supplementary uplink is released through *RRCConnectionReconfiguration*, then UE shall transmit data only on the NR uplink carrier on SCell (Cell 3) within 20ms. If UE stop transmitting data on supplementary uplink carrier on SCell (Cell 3) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

5. For Test 2: Supplementary uplink on Cell 3 is configured to UE during T1

5.1. Repeat steps 1-3.

5.2. During time duration T1, Supplementary uplink of Cell 3 is configured to UE. Setup FR1 SCell (Cell 3) according to parameters given in Table 4.5.4.1.5-2.

5.3. T2 starts when a NR uplink of SCell (Cell 3) is configured to UE through *RRCConnectionReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration".

5.4 T3 starts when the NR uplink is released through *RRCConnectionReconfiguration*, then UE shall transmit data only on the supplementary uplink carrier on SCell (Cell 3) within 20ms. If UE stop transmitting data on NR uplink carrier on SCell (Cell 3) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

6. Repeat steps 1-5 until a test verdict has been achieved.

Each of the events "reconfiguration" and "deconfiguration" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.4.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.8-1  Table H.3.8-2 |

4.5.4.1.5 Test requirements

Table 4.5.4.1.5-1 and 4.5.4.1.5-2 defines the primary level settings including test tolerances for the EN-DC FR1 UE UL carrier RRC reconfiguration delay test with all NR cells in FR1.

Table 4.5.4.1.5-1: NR Cell specific test parameters for  
EN-DC FR1 UE UL carrier RRC reconfiguration delay on PSCell (Cell 2)

| Parameter | Unit | Test Configuration | Test 1 | | | Test 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Channel number |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2 | | | 2 | | |
| TDD configuration |  | Conf 1, 2, 3 | N/A | | | N/A | | |
| Conf 4, 5, 6 | TDD Conf.1.1 | | | TDD Conf.1.1 | | |
| Conf 7, 8, 9 | TDD Conf.2.1 | | | TDD Conf.2.1 | | |
| BWchannel | MHz | Conf 1, 2, 3 | Note 6 | | | Note 6 | | |
| Conf 4, 5, 6 | Note 6 | | | Note 6 | | |
| Conf 7, 8, 9 | Note 6 | | | Note 6 | | |
| BWoccupied | RB | Conf 1, 2, 3 | 52 Note 4 | | | 52 Note 4 | | |
| Conf 4, 5, 6 | 52 Note 4 | | | 52 Note 4 | | |
| Conf 7, 8, 9 | 106 Note 5 | | | 106 Note 5 | | |
| PDSCH reference measurement channel as defined in A.3.1.1 |  | Conf 1, 2, 3 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| Conf 4, 5, 6 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| Conf 7, 8, 9 | SR 2.1 TDD | | | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |  | Conf 1, 2, 3 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Conf 4, 5, 6 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| Conf 7, 8, 9 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.3.1.3 |  | Conf 1, 2, 3 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| Conf 4, 5, 6 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| Conf 7, 8, 9 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 |  | Conf 1, 2, 3, 4, 5, 6 | OP.1 Note 4 | | | OP.1 Note 4 | | |
| Conf 7, 8, 9 | OP.1 Note 5 | | | OP.1 Note 5 | | |
| SSB configuration |  | Conf 1, 2, 3, 4, 5, 6 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| Conf 7, 8, 9 | SSB.2 FR1 | | | SSB.2 FR1 | | |
| SMTC configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | | SMTC.1 | | |
| CSI-RS for tracking |  | Conf 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| Conf 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| Conf 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Conf 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| Conf 5 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| Conf 6 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Conf 7 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| Conf 8 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| Conf 9 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| DL initial BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | | DLBWP.1.1 | | |
| UL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | | -102 | | |
| dBm/ SCS | Conf 1,2,3,4,5,6 | -102 | | | -102 | | |
| Conf 7,8,9 | -99 | | | -99 | | |
|  | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1,2,3,4,5,6 | -86 | -86 | -86 | -86 | -86 | -86 |
| Conf 7,8,9 | -83 | -83 | -83 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1,2,3,4,5,6 | -57.94 | -57.94 | -57.94 | -57.94 | -57.94 | -57.94 |
| dBm/ 38.16MHz | Conf 7,8,9 | -51.84 | -51.84 | -51.84 | -51.84 | -51.84 | -51.84 |
| Propagation Condition |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | | AWGN | | |
| Antenna configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | | 1 x 2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | | | | |

Table 4.5.4.1.5-2: NR Cell specific test parameters for  
EN-DC FR1 UE UL carrier RRC reconfiguration delay on SCell (Cell 3)

| Parameter | Unit | Test Configuration | Test 1 | | | | Test 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | | T3 | T1 | T2 | T3 |
| Channel number |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 3 | | | | 3 | | |
| TDD configuration |  | Conf 1, 4, 7 | N/A | | | | N/A | | |
| Conf 2, 5, 8 | TDDConf.1.1 | | | | TDDConf.1.1 | | |
| Conf 3, 6, 9 | TDDConf.2.1 | | | | TDDConf.2.1 | | |
| BWchannel | MHz | Conf 1, 4, 7 | Note 6 | | | | Note 6 | | |
| Conf 2, 5, 8 | Note 6 | | | | Note 6 | | |
| Conf 3, 6, 9 | Note 6 | | | | Note 6 | | |
| BWoccupied | RB | Conf 1, 4, 7 | 52 Note 4 | | | | 52 Note 4 | | |
| Conf 2, 5, 8 | 52 Note 4 | | | | 52 Note 4 | | |
| Conf 3, 6, 9 | 106 Note 5 | | | | 106 Note 5 | | |
| PUSCH parameters for NR UL carrier |  | Conf 1, 4, 7 | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | | N/A | G-FR1-A3-10 in [28] | N/A |
| Conf 2, 5, 8 | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | | N/A | G-FR1-A3-10 in [28] | N/A |
| Conf 3, 6, 9 | G-FR1-A3-14 in [28] | G-FR1-A3-14 in [28] | G-FR1-A3-14 in [28] | | N/A | G-FR1-A3-14 in [28] | N/A |
| PUCCH parameters  For NR UL carrier |  | Conf 1, 4, 7 | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | | N/A | N/A | N/A |
| Conf 2, 5, 8 | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | | N/A | N/A | N/A |
| Conf 3, 6, 9 | Table 8.3.3.1.2-2 in [28] | Table 8.3.3.1.2-2 in [28] | Table 8.3.3.1.2-2 in [28] | | N/A | N/A | N/A |
| PUSCH parameters for supplementary UL |  | Conf 1, 4, 7 | N/A | G-FR1-A3-10 in [28] | N/A | | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] |
| Conf 2, 5, 8 | N/A | G-FR1-A3-10 in [28] | N/A | | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] |
| Conf 3, 6, 9 | N/A | G-FR1-A3-14 in [28] | N/A | | G-FR1-A3-14 in [28] | G-FR1-A3-14 in [28] | G-FR1-A3-14 in [28] |
| PUCCH parameters for supplementary UL |  | Conf 1, 4, 7 | N/A | N/A | N/A | | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] |
| Conf 2, 5, 8 | N/A | N/A | N/A | | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] |
| Conf 3, 6, 9 | N/A | N/A | N/A | | Table 8.3.3.1.2-2 in [28] | Table 8.3.3.1.2-2 in [28] | Table 8.3.3.1.2-2 in [28] |
| PDSCH reference measurement channel as defined in A.3.1.1 |  | Conf 1, 4, 7 | SR.1.1 FDD | | | | SR.1.1 FDD | | |
| Conf 2, 5, 8 | SR.1.1 TDD | | | | SR.1.1 TDD | | |
| Conf 3, 6, 9 | SR 2.1 TDD | | | | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |  | Conf 1, 4, 7 | CR.1.1 FDD | | | | CR.1.1 FDD | | |
| Conf 2, 5, 8 | CR.1.1 TDD | | | | CR.1.1 TDD | | |
| Conf 3, 6, 9 | CR.2.1 TDD | | | | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.3.1.3 |  | Conf 1, 4, 7 | CCR.1.1 FDD | | | | CCR.1.1 FDD | | |
| Conf 2, 5, 8 | CCR.1.1 TDD | | | | CCR.1.1 TDD | | |
| Conf 3, 6, 9 | CCR.2.1 TDD | | | | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 |  | Conf 1, 2, 4, 5, 7, 8 | OP.1 Note 4 | | | | OP.1 Note 4 | | |
|  | Conf 3, 6, 9 | OP.1 Note 5 | | | | OP.1 Note 5 | | |
| SSB configuration |  | Conf 1, 2, 4, 5, 7,8 | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| Conf 3, 6, 9 | SSB.2 FR1 | | | | SSB.2 FR1 | | |
| SMTC configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | | | SMTC.1 | | |
| CSI-RS for tracking |  | Conf 1 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | |
| Conf 2 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | |
| Conf 3 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | |
| Conf 4 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | |
| Conf 5 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | |
| Conf 6 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | |
| Conf 7 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | |
| Conf 8 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | |
| Conf 9 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | |
| DL initial BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | | | DLBWP.1.1 | | |
| UL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | | | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | | | -102 | | |
| dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -102 | | | | -102 | | |
| Conf 3, 6, 9 | -99 | | | | -99 | | |
|  | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | | 16 | 16 | 16 | 16 |
| Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | | 16 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -86 | -86 | | -86 | -86 | -86 | -86 |
| Conf 3, 6, 9 | -83 | -83 | | -83 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1, 2, 4, 5, 7,8 | -57.94 | -57.94 | | -57.94 | -57.94 | -57.94 | -57.94 |
| dBm/ 38.16MHz | Conf 3, 6, 9 | -51.84 | -51.84 | | -51.84 | -51.84 | -51.84 | -51.84 |
| Propagation Condition |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | | | AWGN | | |
| Antenna configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | | | 1 x 2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | | | | | |

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90 %.

### 4.5.5 Link recovery procedures

#### 4.5.5.0 Minimum conformance requirements

4.5.5.0.1 Minimum conformance requirements for SSB-based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set  estimated over the last TEvaluate\_BFD\_SSB ms period becomes worse than the threshold Qout\_LR\_SSB within TEvaluate\_BFD\_SSB ms period.

The value of TEvaluate\_BFD\_SSB is defined in Table 4.5.5.0.1-1 for FR1.

For FR1,

- , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

Table 4.5.5.0.1-1: Evaluation period TEvaluate\_BFD\_SSB for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_BFD\_SSB (ms) |
| no DRX | Max(50, Ceil(5 × P) × TSSB) |
| DRX cycle ≤ 320ms | Max(50, Ceil(7.5 × P) × Max(TDRX,TSSB)) |
| DRX cycle > 320ms | Ceil(5 × P) × TDRX |
| NOTE: TSSB is the periodicity of SSB in the set . TDRX is the DRX cycle length. | |

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement:

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;

- If SSB and CSI-RS have different SCS:

- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;

- If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.2.2 and 8.5.2.3.

4.5.5.0.2 Minimum conformance requirements for CSI-RS-based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set  estimated over the last TEvaluate\_BFD\_CSI-RS ms period becomes worse than the threshold Qout\_LR\_CSI-RS within TEvaluate\_BFD\_CSI-RS ms period.

The value of TEvaluate\_BFD\_CSI-RS is defined in Table 4.5.5.0.2-1 for FR1.

For FR1:

- , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

The values of MBFD used in Table 4.5.5.0.2-1 is defined as:

- MBFD = 10, if the CSI-RS resource(s) in set  used for BFD is transmitted with Density = 3 and over the bandwidth ≥ 24 PRBs.

The values of PBFD used in Table 4.5.5.0.2-1 is defined as:

For each CSI-RS resource in the set  configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- PBFD = 1,

For each CSI-RS resource in the set  configured for PSCell in NR-DC

PBFD = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set  configured for a SCell

- PBFD = Z in EN-DC or NE-DC or SA.

- PBFD = 2\* Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

Table 4.5.5.0.2-1: Evaluation period TEvaluate\_BFD\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_BFD\_CSI-RS (ms) |
| no DRX | Max(50, Ceil (MBFD × P × PBFD) × TCSI-RS) |
| DRX cycle ≤ 320ms | Max(50, Ceil (1.5 × MBFD × P × PBFD) × Max(TDRX, TCSI-RS)) |
| DRX cycle > 320ms | Ceil (MBFD × P × PBFD) × TDRX |
| NOTE: TCSI-RS is the periodicity of CSI-RS resource in the set . TDRX is the DRX cycle length. | |

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2 and 8.5.3.3.

##### 4.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

[TS 38.133, clause 8.5.7.1]

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

[TS 38.133, clause 8.5.8.1]

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.7.1 and 8.5.8.1.

##### 4.5.5.0.4 Requirements for Beam Failure Recovery in SCell

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [3], if beam recovery procedure is triggered for any of SCells, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than Qout,LR, and the index for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS38.321 [7], if any, for a corresponding SCell.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.9.

#### 4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

4.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC and link recovery.

4.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.1.

4.5.5.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.1.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.



Figure 4.5.5.1.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

4.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.1.4.1-1.

Table 4.5.5.1.4.1-1: Supported test configurations for  
EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.5.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.1.4.1-2.

Table 4.5.5.1.4.1-2: Initial conditions for  
EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.1.4.1-3.

2. Message contents are defined in clause 4.5.5.1.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.1.4.1-3: General test parameters for FR1 PSCell for  
SSB-based beam failure detection and link recovery testing in non-DRX mode

| Parameter | | | | Unit | Value | Comment |
| --- | --- | --- | --- | --- | --- | --- |
| Active E-UTRA PCell | | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | | |  | 1 |  |
| Active PSCell | | | |  | Cell 2 |  |
| RF Channel Number | | | |  | 2 |  |
| Duplex mode | | | Config 1, 4 |  | FDD |  |
| Config 2, 3, 5, 6 | TDD |  |
| BWchannel | | | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
| Config 2, 5 | 10: NRB,c = 52 |  |
| Config 3, 6 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |  |
| Config 2, 5 | TDDConf.1.1 |  |
| Config 3, 6 | TDDConf.2.1 |  |
| CORESET Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |  |
| Config 2, 5 | CR.1.1 TDD |  |
| Config 3, 6 | CR.2.1 TDD |  |
| SSB Configuration | | | Config 1, 4 |  | SSB.3 FR1 |  |
| Config 2, 5 | SSB.3 FR1 |  |
| Config 3, 6 | SSB.4 FR1 |  |
| SMTC Configuration | | | Config 1, 2, 4, 5 |  | SMTC.1 |  |
| Config 3, 6 | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 |  | 15 KHz |  |
| Config 3, 6 | 30 KHz |  |
| PRACH Configuration | | | Config 1, 2, 4, 5 |  | PRACH.2 FR1 | CFRA for BFR |
| Config 3, 6 |  | PRACH.2 FR1 | CFRA for BFR |
| SSB Index assigned as BFD RS (q0) | | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | |  | 1 |  |
| OCNG parameters | | | |  | OP.1 |  |
| CP length | | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format | |  | 1-0 |  |
| Number of Control OFDM symbols | |  | 2 |  |
| Aggregation level | | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |  |
| DMRS precoder granularity | |  | REG bundle size |  |
| REG bundle size | |  | 6 |  |
| DRX | | | |  | OFF |  |
| Gap pattern ID | | | |  | gp0 |  |
| gapOffset | | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | | |  | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
| Config 3, 6 | | | dBm/SCS kHz | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | Config 1, 4 | |  | CSI-RS.1.1 FDD |  |
| Config 2, 5 | |  | CSI-RS.1.1 TDD |  |
| Config 3, 6 | |  | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | Config 1, 4 | |  | TRS.1.1 FDD |  |
| Config 2, 5 | |  | TRS.1.1 TDD |  |
| Config 3, 6 | |  | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | | |  | 0,1 |  |
| T310 timer | | | | ms | 1000 |  |
| N310 | | | |  | 2 |  |
| T1 | | | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 0.37 |  |
| T3 | | | | s | 0.24 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 0.17 |  |
| D1 | | | | s | 0.13 |  |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | | | |

4.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embeded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.

3. The UE sends an RRCReconfigurationComplete (embeded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 4.5.5.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.1.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B; and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the star of T5),the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.1.4.3-1: Common Exception messages for  
EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)  Table H.3.1-4 with A3-offset = 0  Table H.3.1-8 with Condition SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition BFD  Table H.3.5-4  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.5.1.4.3-2: PDCCH *Search Space* for BFR

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 3 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.5.1.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 4.5.5.1.4.3-4: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 4.5.5.1.4.3-5: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

4.5.5.1.5 Test requirements

Tables 4.5.5.1.4.1-3 and 4.5.5.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX.

Table 4.5.5.1.5-1: Cell specific test parameters for FR1 PSCell for  
SSB-based beam failure detection and link recovery testing in non-DRX mode

| Parameter | | Unit | Test 1 | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR\_SSB of set q0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 2, 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 3, 6 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR\_SSB of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 2, 5 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 3, 6 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB\_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 2, 5 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 3, 6 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.1.4-1.  NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 130 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX

4.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, link recovery and long DRX cycle.

4.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.2.

4.5.5.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.



Figure 4.5.5.2.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and  
link recovery testing in DRX mode

4.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.2.4.1-1.

Table 4.5.5.2.4.1-1: Supported test configurations for SSB-based beam failure detection and  
link recovery testing in DRX mode

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.5.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.2.4.1-2.

Table 4.5.5.2.4.1-2: Initial conditions for EN-DC FR1 SSB-based beam failure detection and  
link recovery in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.2.4.1-3.

2. Message contents are defined in clause 4.5.5.2.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.2.4.1-3: General test parameters for FR1 PCell for  
SSB-based beam failure detection and link recovery testing in DRX mode

| Parameter | | | Unit | Value | Comment |
| --- | --- | --- | --- | --- | --- |
| Test 1 |  |
| Active E-UTRA PCell | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | |  | 1 |  |
| Active PSCell | | |  | Cell 2 |  |
| RF Channel Number | | |  | 2 |  |
| Duplex mode | | Config 1, 4 |  | FDD |  |
| Config 2, 3, 5, 6 | TDD |  |
| BWchannel | | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
| Config 2, 5 | 10: NRB,c = 52 |  |
| Config 3, 6 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |  |
| Config 2, 5 | TDDConf.1.1 |  |
| Config 3, 6 | TDDConf.2.1 |  |
| CORESET Reference Channel | | Config 1, 4 |  | CR. 1.1 FDD |  |
| Config 2, 5 | CR. 1.1 TDD |  |
| Config 3, 6 | CR. 2.1 TDD |  |
| SSB Configuration | | Config 1, 4 |  | SSB.3 FR1 |  |
| Config 2, 5 | SSB.3 FR1 |  |
| Config 3, 6 | SSB.4 FR1 |  |
| SMTC Configuration | | Config 1, 2, 4, 5 |  | SMTC.1 |  |
| Config 3, 6 | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 |  | 15 KHz |  |
| Config 3, 6 | 30 KHz |  |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | PRACH.2 FR1 | CFRA for BFR |
| Config 3, 6 | PRACH.2 FR1 | CFRA for BFR |
| SSB Index assigned as BFD RS (q0) | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | |  | 1 |  |
| OCNG parameters | | |  | OP.1 |  |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | DCI format | |  | 1-0 |  |
| Number of Control OFDM symbols | |  | 2 |  |
| Aggregation level | | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |  |
| DMRS precoder granularity | |  | REG bundle size |  |
| REG bundle size | |  | 6 |  |
| DRX | | |  | DRX.7 |  |
| Gap pattern ID | | |  | N.A. |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
| Config 3, 6 | | dBm/SCS kHz | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | |  | CSI-RS.1.1 FDD |  |
| Config 2, 5 | |  | CSI-RS.1.1 TDD |  |
| Config 3, 6 | |  | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | Config 1, 4 | |  | TRS.1.1 FDD |  |
| Config 2, 5 | |  | TRS.1.1 TDD |  |
| Config 3, 6 | |  | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | |  | 0,1 |  |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 5.17 |  |
| T3 | | | s | 3.24 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 1.97 |  |
| D1 | | | s | 1.93 |  |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | | |

4.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 4.5.5.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.2.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B; and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5), the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.2.4.3-1: Common Exception messages for  
EN-DC FR1 SSB-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A  Table H.3.5-4  Table H.3.7-1 with Condition DRX.7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.5.2.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 3 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.5.2.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 4.5.5.2.4.3-4: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 4.5.5.2.4.3-5: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

4.5.5.2.5 Test requirements

Tables 4.5.5.2.4.1-3 and 4.5.5.2.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX.

Table 4.5.5.2.5-1: Cell specific test parameters for FR1 PSCell for  
SSB-based beam failure detection and link recovery testing in DRX mode

| Parameter | | Unit | Test 1 | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR\_SSB of set q0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 2, 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 3, 6 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR\_SSB of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 2, 5 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 3, 6 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB\_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 2, 5 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 3, 6 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Void  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.2.4-1.  NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

4.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC, CSI-RS based RLM and link recovery.

4.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.3.

4.5.5.3.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.3.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q0 in the active PSCell to emulate CSI-RS based beam failure. Figure 4.5.5.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.



Figure 4.5.5.3.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and  
link recovery testing in non-DRX mode

4.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.3.4.1-1.

Table 4.5.5.3.4.1-1: Supported test configurations for  
EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.5.3-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.3-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.3-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.3-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.3-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.3-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.3.4.1-2.

Table 4.5.5.3.4.1-2: Initial conditions for EN-DC FR1 CSI-RS-based  
beam failure detection and link recovery in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.3.4.1-3.

2. Message contents are defined in clause 4.5.5.3.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.3.4.1-3: General test parameters for FR1 PSCell for  
CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

| Parameter | | Unit | Value | Comment |
| --- | --- | --- | --- | --- |
| Test 1 |
| Active PCell | |  | Cell 1 |  |
| RF Channel Number | |  | 1 |  |
| Active PSCell | |  | Cell 2 |  |
| RF Channel Number | |  | 2 |  |
| Duplex mode | Config 1, 4 |  | FDD |  |
| Config 2, 3, 5, 6 | TDD |  |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
|  | Config 2, 5 |  | 10: NRB,c = 52 |  |
|  | Config 3, 6 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | Config 1, 4 |  | Not Applicable |  |
| Config 2, 5 | TDDConf.1.1 |  |
| Config 3, 6 | TDDConf.2.1 |  |
| CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |  |
| Config 2, 5 | CR.1.1 TDD |
| Config 3, 6 | CR.2.1 TDD |
| SSB Configuration | Config 1, 4 |  | SSB.3 FR1 |  |
| Config 2, 5 | SSB.3 FR1 |
| Config 3, 6 | SSB.4 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 |  | SMTC.1 |  |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 |  | 15 KHz |  |
| Config 3, 6 | 30 KHz |  |
| PRACH Configuration | Config 1, 2, 4, 5 |  | PRACH.4 FR1 |  |
| Config 3, 6 | PRACH.4 FR1 |
| csi-RS-Index assigned as beam failure detection RS in set q0 | |  | 0 |  |
| OCNG parameters | |  | OP.1 |  |
| CP length | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | DCI format |  | 1-0 |  |
| Number of Control OFDM symbols |  | 2 |  |
| Aggregation level | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
| DMRS precoder granularity |  | REG bundle size |  |
| REG bundle size |  | 6 |  |
| DRX | |  | OFF |  |
| Gap pattern ID | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | |  | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
| Config 3, 6 | dBm/SCS kHz | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for q0 and q1 | Config 1, 4 |  | CSI-RS.1.2 FDD |  |
| Config 2, 5 | CSI-RS.1.2 TDD |
| Config 3, 6 | CSI-RS.2.2 TDD |
| CSI-RS configuration for CSI reporting | Config 1, 4 |  | CSI-RS.1.1 FDD |  |
| Config 2, 5 | CSI-RS.1.1 TDD |
| Config 3, 6 | CSI-RS.2.1 TDD |
| TRS configuration | Config 1, 4 |  | TRS.1.1 FDD |  |
| Config 2, 5 |  | TRS.1.1 TDD |  |
| Config 3, 6 |  | TRS.1.2 TDD |  |
| csi-RS-Index assigned as RLM RS | Config 1, 4 |  | CSI-RS.1.2 FDD |  |
| Config 2, 5 | CSI-RS.1.2 TDD |
| Config 3, 6 | CSI-RS.2.2 TDD |
| T310 Timer | | ms | 1000 |  |
| N310 | |  | 2 |  |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.18 |  |
| T3 | | s | 0.14 |  |
| T4 | | s | 0 |  |
| T5 | | s | 0.08 |  |
| D1 | | s | 0.04 |  |
| NOTE: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

4.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 4.5.5.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.3.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B, and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5), the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 4.5.5.3.4.3-1: Common Exception messages for  
EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD  Table H.3.1-10 with Condition CSI-RS  Table H.3.1-10A  Table H.3.5-4  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.5.3.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 4 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.5.3.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 4.5.5.3.4.3-4: *NZP-CSI-RS-Resource*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
| Information Element | Value/remark | Comment | Condition |
| NZP-CSI-RS-Resource ::= SEQUENCE { |  |  |  |
| powerControlOffsetSS | db0 |  |  |
| } |  |  |  |

Table 4.5.5.3.4.3-4: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 4.5.5.3.4.3-5: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

4.5.5.3.5 Test requirements

Tables 4.5.5.3.4.1-3 and 4.5.5.3.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 4.5.5.3.5-1: Cell specific test parameters for FR1 PSCell for  
CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

| Parameter | | Unit | Test 1 | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR\_CSI-RS of set q0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 2, 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 3, 6 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR\_CSI-RS of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 2, 5 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 3, 6 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS\_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 2, 5 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 3, 6 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  NOTE 4: Void.  NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  NOTE 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.3.4-1.  NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 40 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

4.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM, link recovery and long DRX cycle.

4.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

4.5.5.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.4.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q0 in the active PSCell to emulate CSI-RS based beam failure. Figure 4.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.



Figure 4.5.5.4.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based  
beam failure detection and link recovery in DRX

4.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.4.1-1.

Table 4.5.5.4.4.1-1: Supported test configurations for EN-DC FR1 CSI-RS-based  
beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.5.4-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.5.4-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.5.4-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.5.4-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.5.4-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.5.4-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.4.4.1-2.

Table 4.5.5.4.4.1-2: Initial conditions for EN-DC FR1 CSI-RS-based  
beam failure detection and link recovery in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.4.4.1-3.

2. Message contents are defined in clause 4.5.5.4.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1, Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.5.4.4.1-3: General test parameters for EN-DC FR1 CSI-RS-based  
beam failure detection and link recovery in DRX

| Parameter | | | | Unit | | Value | | Comment |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test 1 | |
| Active PCell | | | |  | | Cell 1 | |  |
| RF Channel Number | | | |  | | 1 | |  |
| Active PSCell | | | |  | | Cell 2 | |  |
| RF Channel Number | | | |  | | 2 | |  |
| Duplex mode | | Config 1, 4 | |  | | FDD | |  |
| Config 2, 3, 5, 6 | | TDD | |  |
| BWchannel | | Config 1, 4 | | MHz | 10: NRB,c = 52 | |  | |
|  | | Config 2, 5 | |  | 10: NRB,c = 52 | |  | |
|  | | Config 3, 6 | |  | 40: NRB,c = 106 | |  | |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.0.1 | |  | |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.1.1 | |  | |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.0.1 | |  | |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.1.1 | |  | |
| TDD Configuration | | Config 1, 4 | |  | | Not Applicable | |  |
| Config 2, 5 | | TDDConf.1.1 | |  |
| Config 3, 6 | | TDDConf.2.1 | |  |
| CORESET Reference Channel | | Config 1, 4 | |  | | CR.1.1 FDD | |  |
| Config 2, 5 | | CR.1.1 TDD | |
| Config 3, 6 | | CR.2.1 TDD | |
| SSB Configuration | | Config 1, 4 | |  | | SSB.3 FR1 | |  |
| Config 2, 5 | | SSB.3 FR1 | |
| Config 3, 6 | | SSB.4 FR1 | |
| SMTC Configuration | | Config 1, 2, 4, 5 | |  | | SMTC.1 | |  |
| Config 3, 6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 | |  | | 15 KHz | |  |
| Config 3, 6 | | 30 KHz | |  |
| PRACH Configuration | | Config 1, 2, 4, 5 | |  | | PRACH.4 FR1 | |  |
| Config 3, 6 | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set q0 | | | |  | | 0 | |  |
| OCNG parameters | | | |  | | OP.1 | |  |
| CP length | | | |  | | Normal | |  |
| Correlation Matrix and Antenna Configuration | | | |  | | 2x2 Low | |  |
| Beam failure detection transmission parameters | | DCI format | |  | | 1-0 | |  |
| Number of Control OFDM symbols | |  | | 2 | |  |
| Aggregation level | | CCE | | 8 | |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | | 0 | |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | | 0 | |  |
| DMRS precoder granularity | |  | | REG bundle size | |  |
| REG bundle size | |  | | 6 | |  |
| DRX | | | |  | | DRX.7 | |  |
| Gap pattern ID | | | |  | | N.A. | |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | | | |  | | 1 | |  |
| rlmInSyncOutOfSyncThreshold | | | |  | | absent | | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | | | Config 1, 2, 4, 5 | dBm/SCS kHz | | -98 | | Threshold used for Qin\_LR\_SSB |
| Config 3, 6 | dBm/SCS kHz | | -95 | | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | | |  | | db0 | | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | |  | | n1 | | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | |  | | pbfd4 | | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for q0 and q1 | Config 1, 4 | | |  | | CSI-RS.1.2 FDD | |  |
| Config 2, 5 | | | CSI-RS.1.2 TDD | |
| Config 3, 6 | | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | |  | | CSI-RS.1.1 FDD | |  |
| Config 2, 5 | | | CSI-RS.1.1 TDD | |
| Config 3, 6 | | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | |  | | TRS.1.1 FDD | |  |
| Config 2, 5 | | |  | | TRS.1.1 TDD | |  |
| Config 3, 6 | | |  | | TRS.1.2 TDD | |  |
| csi-RS-Index assigned as RLM RS | Config 1, 4 | | |  | | CSI-RS.1.2 FDD | |  |
| Config 2, 5 | | | CSI-RS.1.2 TDD | |
| Config 3, 6 | | | CSI-RS.2.2 TDD | |
| T310 Timer | | | | ms | | 1000 | |  |
| N310 | | | |  | | 2 | |  |
| T1 | | | | s | | 1 | | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | | 8.37 | |  |
| T3 | | | | s | | 6.44 | |  |
| T4 | | | | s | | 0 | |  |
| T5 | | | | s | | 1.97 | |  |
| D1 | | | | s | | 1.93 | |  |
| NOTE: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | | | |

Table 4.5.5.4.4.1-4: Void

Table 4.5.5.4.4.1-5: Void

Table 4.5.5.4.4.1-6: Void

4.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of FR1 PSCell according to T1 in Table 4.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.4.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.4.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD  Table H.3.1-10 with Condition CSI-RS  Table H.3.1-10A  Table H.3.5-4  Table H.3.7-1 with Condition DRX.7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.5.4.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 3 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.5.4.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 4.5.5.4.4.3-4: *NZP-CSI-RS-Resource*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
| Information Element | Value/remark | Comment | Condition |
| NZP-CSI-RS-Resource ::= SEQUENCE { |  |  |  |
| powerControlOffsetSS | db0 |  |  |
| } |  |  |  |

Table 4.5.5.4.4.3-5: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 6.5.5.4.4.3-6: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

4.5.5.4.5 Test requirement

Tables 4.5.5.4.4.1-3 and 4.5.5.4.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 4.5.5.4.5-1: Cell specific test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR\_CSI-RS of set q0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 2, 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| Config 3, 6 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR\_CSI-RS of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 2, 5 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| Config 3, 6 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS\_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 2, 5 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| Config 3, 6 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.3.4-1.  Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.5 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

4.5.5.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.5.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery.

4.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

4.5.5.5.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.5.4-1 shows the SNR of the CSI-RS in set q0 in the active SCell to emulate beam failure. Figure 4.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

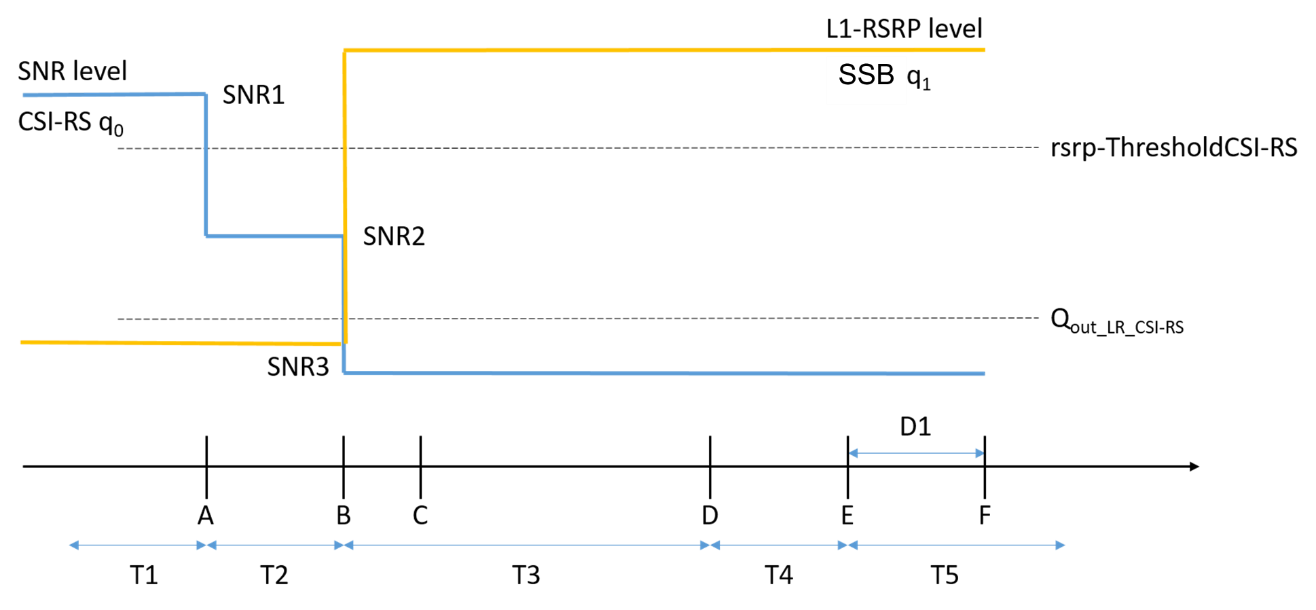


Figure 4.5.5.5.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

4.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.4.1-1.

Table 4.5.5.5.4.1-1: Supported test configurations for EN-DC FR1 Scell CSI-RS-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 4.5.5.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.5.4.1-2.

Table 4.5.5.5.4.1-2: Initial conditions for EN-DC FR1 Scell CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.5.4.1-3.

2. Message contents are defined in clause 4.5.5.5.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test

Table 4.5.5.5.4.1-3: General test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** | **Comment** |
|  | | |  | **Test 1** |  |
| Active PCell | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | |  | 1 |  |
| Active PSCell | | |  | Cell 2 |  |
| RF Channel Number for PSCell | | |  | 2 |  |
| Active SCell | | |  | Cell 3 |  |
| RF Channel Number for SCell | | |  | 3 |  |
| Duplex mode | | Config 1, 4 |  | FDD |  |
|  | | Config 2, 3, 5, 6 |  | TDD |  |
| BW channel | | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
| Config 2, 5 | 10: NRB,c = 52 |  |
| Config 3, 6 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |  |
|  | | Config 2, 5 |  | TDDConf.1.1 |  |
|  | | Config 3, 6 |  | TDDConf.2.1 |  |
| CORESET | | Config 1, 4 |  | CR.1.1 FDD | A. 1.2 |
| Reference Channel | | Config 2, 5 |  | CR.1.1 TDD |  |
|  | | Config 3, 6 |  | CR.2.1 TDD |  |
| SSB Configuration | | Config 1, 4 |  | SSB.1 FR1 | A.3 |
|  | | Config 2, 5 |  | SSB.1 FR1 |  |
|  | | Config 3, 6 |  | SSB.2 FR1 |  |
| SMTC Configuration | | Config 1, 2, 3, 4, 5, 6 |  | SMTC.1 | A.4 |
| PDSCH/PDCCH | | Config 1, 2, 4, 5 | kHz | 15 |  |
| subcarrier spacing | | Config 3, 6 |  | 30 |  |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | PRACH.2 FR1 | Table A.7.1-1 |
| Config 3, 6 |  | PRACH.2 FR1 | Table A.7.1-1 |
| csi-RS-Index assigned as beam failure detection RS in set q0 in activated SCell | | |  | 0 |  |
| OCNG parameters | | |  | OP.1 | A.2.1 |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure | | DCI format |  | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
|  | | DMRS precoder granularity |  | REG bundle size |  |
|  | | REG bundle size |  | 6 |  |
| DRX | | |  | OFF |  |
| Gap pattern ID | | |  | N.A. |  |
| schedulingRequestID-BFR-SCell-r16 | | |  | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp- | Config 1, 2, 4, 5 | | dBm/SCS | -98 | Threshold used |
| ThresholdBFRSSB | Config 3, 6 | | kHz | -95 | for Qin\_LR\_SSB |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS | | Config 1, 4 |  | CSI-RS.1.2 FDD | A.1.4 |
| configuration for q0 | | Config 2, 5 |  | CSI-RS.1.2 TDD |  |
| in activated SCell | | Config 3, 6 |  | CSI-RS.2.2 TDD |  |
| CSI-RS | | Config 1, 4 |  | CSI-RS.1.1 FDD | A.1.4 |
| configuration for | | Config 2, 5 |  | CSI-RS.1.1 TDD |  |
| CSI reporting | | Config 3, 6 |  | CSI-RS.2.1 TDD |  |
| TRS configuration | | Config 1, 4 |  | TRS.1.1 FDD |  |
|  | | Config 2, 5 |  | TRS.1.1 TDD |  |
|  | | Config 3, 6 |  | TRS.1.2 TDD |  |
| csi-RS-Index | | Config 1, 4 |  | CSI-RS.1.2 FDD | A.1.4 |
| assigned as RLM | | Config 2, 5 |  | CSI-RS.1.2 TDD |  |
| RS in PSCell | | Config 3, 6 |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 0.18 |  |
| T3 | | | s | 0.14 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 0.17 |  |
| D1 | | | s | 0.13 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

4.5.5.5.4.2 Test procedure

Same test procedure as described in section 4.5.5.3.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on the PCell before time point B

and

c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

4.5.5.5.4.3 Message contents

Same message contents as described in section 4.5.5.3.4.3 with following exceptions:

Table 4.5.5.5.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-10 with Condition SSB CBD |

4.5.5.5.5 Test requirements

Table 4.5.5.5.5-1: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** | **Test 1 Cell3** | | | | |
|  | |  | **T1 to T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  |  | | | | |
| SNR\_SSB of set q0 | Config 1, 4 | dB | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
|  | Config 2, 5 |  | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
|  | Config 3, 6 |  | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR\_CSI-RS of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
|  | Config 2, 5 |  | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
|  | Config 3, 6 |  | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB\_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
|  | Config 2, 5 |  | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
|  | Config 3, 6 |  | -105.2 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
|  | Config 1, 4 | dBm/15 kHz | -98 | -98 | | | | |
|  | Config 2, 5 |  | -98 | -98 | | | | |
|  | Config 3, 6 |  | -98 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6]. | | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing  a beam associated with the candidate beam set q1. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.6 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

4.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS based beam failure in the set q0 configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.6.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery and long DRX cycle.

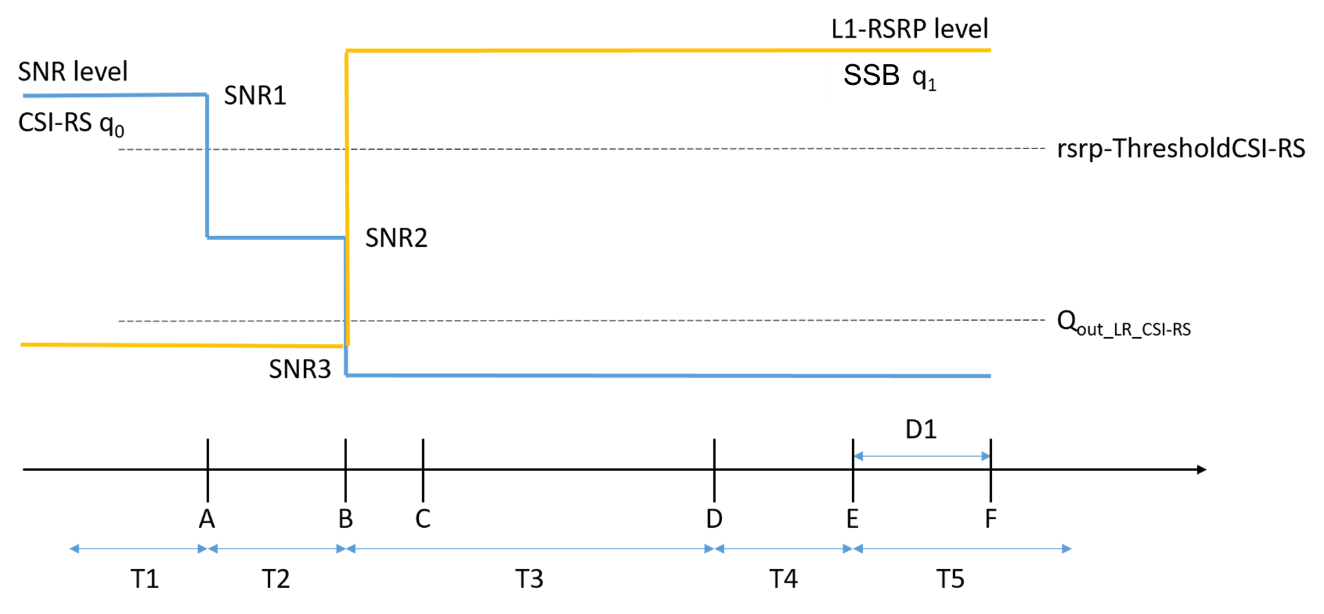
4.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

4.5.5.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.6.4.1-1 shows the SNR of the CSI-RS in set q0 in the active SCell to emulate beam failure. Figure 4.5.5.6.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

****

**Figure 4.5.5.6.4.1-1: SNR and L1-RSRP variation for beam failure detection and LR testing for SCell in DRX mode**

4.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.6.4.1-1.

Table 4.5.5.6.4.1-1: Supported test configurations for FR1 PCell and SCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 4.5.5.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.6.4.1-2.

Table 4.5.5.6.4.1-2: Initial conditions for EN-DC FR1 SCell CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.6.4.1-3.

2. Message contents are defined in clause 4.5.5.6.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test

Table 4.5.5.6.4.1-3: General test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **Value** | **Comment** |
|  | | | |  | **Test 1** |  |
| Active PCell | | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | | |  | 1 |  |
| Active PSCell | | | |  | Cell 2 |  |
| RF Channel Number for PSCell | | | |  | 2 |  |
| Active SCell | | | |  | Cell 3 |  |
| RF Channel Number for SCell | | | |  | 3 |  |
| Duplex mode | | | Config 1, 4 |  | FDD |  |
|  | | | Config 2, 3, 5, 6 |  | TDD |  |
| BWchannel | | | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
| Config 2, 5 | 10: NRB,c = 52 |  |
| Config 3, 6 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |  |
|  | | | Config 2, 5 |  | TDDConf.1.1 |  |
|  | | | Config 3, 6 |  | TDDConf.2.1 |  |
| CORESET Reference | | | Config 1, 4 |  | CR.1.1 FDD | A.1.2 |
| Channel | | | Config 2, 5 |  | CR.1.1 TDD |  |
|  | | | Config 3, 6 |  | CR.2.1 TDD |  |
| SSB Configuration | | | Config 1, 4 |  | SSB.1 FR1 | A.3 |
|  | | | Config 2, 5 |  | SSB.1 FR1 |  |
|  | | | Config 3, 6 |  | SSB.2 FR1 |  |
| SMTC Configuration | | | Config 1, 2, 3, 4, 5, 6 |  | SMTC.1 | A.4 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 | kHz | 15 |  |
|  | | | Config 3, 6 |  | 30 |  |
| PRACH Configuration | | | Config 1, 2, 4, 5 |  | PRACH.2 FR1 |  |
| Config 3, 6 |  | PRACH.2 FR1 |  |
| csi-RS-Index assigned as beam failure detection RS in set q0 in activated SCell | | | |  | 0 |  |
| OCNG parameters | | | |  | OP.1 | A.2.1 |
| CP length | | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |  |
| Beam failure detection | | | DCI format |  | 1-0 |  |
| transmission parameters | | | Number of Control OFDM symbols |  | 2 |  |
|  | | | Aggregation level | CCE | 8 |  |
|  | | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
|  | | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
|  | | | DMRS precoder granularity |  | REG bundle size |  |
|  | | | REG bundle size |  | 6 |  |
| DRX | | | |  | DRX.7 | A.5 |
| Gap pattern ID | | | |  | N.A. |  |
| schedulingRequestID-BFR-SCell-r16 | | | |  | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | | | |  | absent | When the field is absent, the UE applies the value 0. ((TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdBFR | Config 1, 2, 4, 5 | | | dBm/SCS | -98 | Threshold used |
|  | Config 3, 6 | | |  | -95 | for Qin\_LR\_SSB |
| powerControlOffsetSS | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for q0 in activated SCell | | Config 1, 4 | |  | CSI-RS.1.2 FDD | A.1.4 |
|  | | Config 2, 5 | |  | CSI-RS.1.2 TDD |  |
|  | | Config 3, 6 | |  | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for CSI reporting | | Config 1, 4 | |  | CSI-RS.1.1 FDD | A.1.4 |
|  | | Config 2, 5 | |  | CSI-RS.1.1 TDD |  |
|  | | Config 3, 6 | |  | CSI-RS.2.1 TDD |  |
| TRS configuration | | Config 1, 4 | |  | TRS.1.1 FDD |  |
|  | | Config 2, 5 | |  | TRS.1.1 TDD |  |
|  | | Config 3, 6 | |  | TRS.1.2 TDD |  |
| csi-RS-Index assigned as RLM RS in PSCell | | Config 1, 4 | |  | CSI-RS.1.2 FDD | A.1.4 |
|  | | Config 2, 5 | |  | CSI-RS.1.2 TDD |  |
|  | | Config 3, 6 | |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | | | ms | 1000 |  |
| N310 | | | |  | 2 |  |
| T1 | | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 8.37 |  |
| T3 | | | | s | 6.44 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 1.97 |  |
| D1 | | | | s | 1.93 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | |

4.5.5.6.4.2 Test procedure

Same test procedure as described in section 4.5.5.4.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

7. If the SS:

a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on the PCell before time point B

and

c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

4.5.5.6.4.3 Message contents

Same message contents as described in section 4.5.5.4.4.3 with following exceptions:

Table 4.5.5.6.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-10 with Condition SSB CBD |

4.5.5.6.5 Test requirement

Tables 4.5.5.6.4.1-3 and 4.5.5.6.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 4.5.5.6.5-1: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** | **Test 1 Cell3** | | | | |
|  | |  | **T1 to T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  |  | | | | |
| SNR\_SSB of set q0 | Config 1, 4 | dB | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
|  | Config 2, 5 |  | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
|  | Config 3, 6 |  | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR\_CSI-RS of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
|  | Config 2, 5 |  | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
|  | Config 3, 6 |  | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB\_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
|  | Config 2, 5 |  | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
|  | Config 3, 6 |  | -105.2 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
|  | Config 1, 4 | dBm/ 15 kHz | -98 | -98 | | | | |
|  | Config 2, 5 |  | -98 | -98 | | | | |
|  | Config 3, 6 |  | -98 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6. | | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing  a beam associated with the candidate beam set q1. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.7 EN-DC FR1 PSCell TRP specific SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is incomplete in following aspects:

- TT analysis has not been provided

- TS 38.522 applicability spec update is pending

4.5.5.7.1 Test Purpose

The purpose of this test is to verify that the UE properly detects the TRP specific SSB-based beam failure in the set (q0,0), (q0,1) configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set (q1,0) and (q1,1). The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell with *schedulingRequestID-BFR-r17* configured, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.7.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward, supporting EN-DC and link recovery.

4.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.7.

4.5.5.7.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.7.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. 

Figure 4.5.5.7.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

4.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.7.4.1-1.

Table 4.5.5.7.4.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.7.4.1-2.

Table 4.5.5.7.4.1-2: Initial conditions for TRP specific EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.7.4.1-3.

2. Message contents are defined in clause 4.5.5.7.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.7.4.1-3: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Value | Comment |
|  | | | |  | Test 1 |  |
| Active E-UTRA PCell | | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | | |  | 1 |  |
| Active PSCell | | | |  | Cell 2 |  |
| RF Channel Number for PSCell | | | |  | 2 |  |
| Duplex mode | | | Config 1, 4 |  | FDD |  |
|  | | | Config 2, 3, 5, 6 |  | TDD |  |
| BW channel | | | Config 1, 4 |  | 10: NRB,c = 52 |  |
| Config 2, 5 | MHz | 10: NRB,c = 52 |  |
| Config 3, 6 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |  |
|  | | | Config 2, 5 |  | TDDConf.1.1 |  |
|  | | | Config 3, 6 |  | TDDConf.2.1 |  |
| CORESET  Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |  |
| Config 2, 5 |  | CR.1.1 TDD |  |
| Config 3, 6 |  | CR.2.1 TDD |  |
| SSB Configuration for TRP0 | | | Config 1, 4 |  | SSB.3 FR1 |  |
| Config 2, 5 |  | SSB.3 FR1 |
| Config 3, 6 |  | SSB.4 FR1 |
| SSB Configuration for TRP1 | | | Config 1, 4 |  | SSB.7 FR1 |  |
| Config 2, 5 |  | SSB.7 FR1 |
| Config 3, 6 |  | SSB.8 FR1 |
| SMTC Configuration | | | Config 1, 2, 3, 4, 5, 6 |  | SMTC.1 |  |
| PDSCH/PDCCH | | | Config 1, 2, 4, 5 | kHz | 15 |  |
| subcarrier spacing | | | Config 3, 6 |  | 30 |  |
| PRACH Configuration | | | Config 1, 2, 4, 5 |  | PRACH.2 FR1 | CFRA for BFR |
| Config 3, 6 |  | PRACH.2 FR1 | CFRA for BFR |
| SSB Index assigned as BFD RS (q0,0) | | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1,0) | | | |  | 1 |  |
| SSB Index assigned as BFD RS (q0,1) | | | |  | 2 |  |
| SSB Index assigned as CBD RS (q1,1) | | | |  | 3 |  |
| OCNG parameters | | | |  | OP.1 |  |
| CP length | | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |  |
| Beam failure  detection transmission parameters | DCI format | | |  | 1-0 |  |
| Number of Control OFDM symbols | | |  | 2 |  |
| Aggregation level | | | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 |  |
| DMRS precoder granularity | | |  | REG bundle size |  |
| REG bundle size | | |  | 6 |  |
| DRX | | | |  | OFF |  |
| Gap pattern ID | | | |  | gp0 |  |
| gapOffset | | | |  | 0 |  |
| schedulingRequestID-BFR- r17 | | | |  | Configured |  |
| Periodicity of PUCCH for SR configuration for BFR on PSCell | | Config 1, 2, 4, 5 | | slot | 5 | 5ms |
| Config 3, 6 | | 10 |
| rlmInSyncOutOfSyncThreshold | | | |  | absent | When the field is absent, the UE applies the value 0. |
| rsrp- | | Config 1, 2, 4, 5 | | dBm/SCS | -98 | Threshold used |
| ThresholdBFR | | Config 3, 6 | |  | -95 | for Qin\_LR\_SSB |
| powerControlOffsetSS | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| SSB Index assigned as RLM RS | | | |  | 0,1,2,3 |  |
| T310 Timer | | | | ms | 1000 |  |
| N310 | | | |  | 2 |  |
| T1 | | | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 0.37 |  |
| T3 | | | | s | 0.24 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 0.17 |  |
| D1 | | | | s | 0.13 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts.  Note 3: E-UTRAN is in non-DRX mode under test. | | | | | | |

4.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embeded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.

3. The UE sends an RRCReconfigurationComplete (embeded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 4.5.5.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR values of TRP1 and TRP2 to T2 as specified in Table 4.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR values of TRP1 and TRP2 to T3 as specified in Table 4.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR values of TRP1 and TRP2 to T4 as specified in Table 4.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR values of TRP1 and TRP2 to T5 as specified in Table 4.5.5.7.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set q1,0 and q1,1 before time point B; and

c) detects preamble on a beam associated with the candidate beam set q1,0 and q1,1 before time point F (D1 after the star of T5), the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.7.4.3-1: Common Exception messages for  
EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)  Table H.3.1-4 with A3-offset = 0  Table H.3.1-8A with Condition SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition BFD  Table H.3.5-4  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.5.5.7.4.3-2: PDCCH *Search Space* for BFR

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 3 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.5.7.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 4.5.5.7.4.3-4: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 4.5.5.7.4.3-5: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

Table 4.5.5.7.4.3-6: *MAC-CellGroupConfig for R17 BFR*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1, Table 4.6.3-68 |  |  |  |
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { |  |  |  |
| schedulingRequestID-BFR-r17 | Not present |  |  |
| schedulingRequestID-BFR2-r17 | Not present |  |  |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config |  |  |
| } |  |  |  |

4.5.5.7.5 Test requirements

Tables 4.5.5.7.4.1-3 and 4.5.5.7.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX.

Table 4.5.5.7.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0,0 | Config 1, 4 | dB | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
|  | Config 2, 5 |  | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
|  | Config 3, 6 |  | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
| SNR\_SSB of set q0,1 | Config 7,10 | dB | 5+TT | 5+TT | 5+TT | 5+TT | 5+TT |
|  | Config 8, 11 |  | 5+TT | 5+TT | 5+TT | 5+TT | 5+TT |
|  | Config 9, 12 |  | 5+TT | 5+TT | 5+TT | 5+TT | 5+TT |
| SNR\_SSB of set q1,0 | Config 1, 4 | dB | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
|  | Config 2, 5 |  | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
|  | Config 3, 6 |  | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
| SNR\_SSB of set q1,1 | Config 7, 10 | dB | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
|  | Config 8, 11 |  | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
|  | Config 9, 12 |  | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
| SSB\_RP of set q1,0 | Config 1, 4 | dBm/SCS | -108+TT | -108+TT | -88+TT | -88+TT | -88+TT |
|  | Config 2, 5 | kHz | -108+TT | -108+TT | -88+TT | -88+TT | -88+TT |
|  | Config 3, 6 |  | -105+TT | -105+TT | -85+TT | -85+TT | -85+TT |
| SSB\_RP of set q1,1 | Config 7, 10 | dBm/SCS | -108+TT | -108+TT | -88+TT | -88+TT | -88+TT |
| Config 8, 11 | kHz | -108+TT | -108+TT | -88+TT | -88+TT | -88+TT |
| Config 9, 12 |  | -105+TT | -105+TT | -85+TT | -85+TT | -85+TT |
|  | Config 1, 4 | dBm/15 KHz | -98+TT | | | | |
|  | Config 2, 5 |  | -98+TT | | | | |
|  | Config 3, 6 |  | -98+TT | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.7.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6 of 38.133. | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1,0 and q1,1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1,0. The UE shall not transmit PUCCH with an LRR with the candidate beam set q1,0 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.5.8 EN-DC FR1 SCell with TRP specific CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Editor's Note: This test case is incomplete in following aspects:

- TT analysis has not been provided.

- TS 38.522 applicability spec update is pending

4.5.5.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the CSI-RS-based beam failure on the TRP using the respective configured BFD set for TRP0 and for TRP1. After the BFD is detected for the TRP, the test further verifies whether the UE performs the correct SSB-based link recovery based on the configured beam candidate set for TRP0 and for TRP1. In the test one TRP (TRP0) is provided with schedulingRequestID-BFR-r17 and other TRP (TRP1) is not provided with scheduling request ID. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.8.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery.

4.5.5.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.8.

4.5.5.8.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.8.2-1 shows the SNR of the CSI-RS in set q0,0 in the TRP0 to emulate beam failure. Figure 4.5.5.8.2-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q10 and q11 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

Graphical user interface, application

Description automatically generated

Figure 4.5.5.8.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for TRP0 in non-DRX mode

4.5.5.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.8.4.1-1.

Table 4.5.5.8.4.1-1: Supported test configurations for FR1 PCell and SCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.5.5.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.8.4.1-2.

Table 4.5.5.8.4.1-2: Initial conditions for TRP specific EN-DC FR1 Scell CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 4.5.5.8.4.1-3.

2. Message contents are defined in clause 4.5.5.8.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test

Table 4.5.5.8.4.1-3: General test parameters for TRP specific EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 | Same configuration for both TRP wherever applicable |
| Active PCell | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | |  | 1 |  |
| Active PSCell | | |  | Cell 2 |  |
| RF Channel Number for PSCell | | |  | 2 |  |
| Active SCell | | |  | Cell 3 |  |
| RF Channel Number for SCell | | |  | 3 |  |
| Duplex mode | | Config 1, 4 |  | FDD |  |
|  | | Config 2, 3, 5, 6 |  | TDD |  |
| BW channel | | Config 1, 4 |  | 10: NRB,c = 52 |  |
|  | | Config 2, 5 | MHz | 10: NRB,c = 52 |  |
|  | | Config 3, 6 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |  |
|  | | Config 2, 5 |  | TDDConf.1.1 |  |
|  | | Config 3, 6 |  | TDDConf.2.1 |  |
| CORESET | | Config 1, 4 |  | CR.1.1 FDD | A.1.2 |
| Reference Channel | | Config 2, 5 |  | CR.1.1 TDD |  |
|  | | Config 3, 6 |  | CR.2.1 TDD |  |
| SSB Configuration | | Config 1, 4 |  | SSB.1 FR1 | A.3.10 |
|  | | Config 2, 5 |  | SSB.1 FR1 | Same configuration for both TRP |
|  | | Config 3, 6 |  | SSB.2 FR1 |  |
| SMTC Configuration | | Config 1, 2, 3, 4, 5, 6 |  | SMTC.1 | A.4, Same configuration for both TRP |
| PDSCH/PDCCH | | Config 1, 2, 4, 5 | kHz | 15 |  |
| subcarrier spacing | | Config 3, 6 |  | 30 |  |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | PRACH.2 FR1 | Table A.7.1-1 |
| Config 3, 6 |  | PRACH.2 FR1 | Table A.7.1-1 |
| csi-RS-Index assigned as beam failure detection RS in set q00 in activated SCell | | |  | 0 |  |
| csi-RS-Index assigned as beam failure detection RS in set q01 in activated SCell | | |  | 2 |  |
| OCNG parameters | | |  | OP.1 | A.2.1 |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure | | DCI format |  | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
|  | | DMRS precoder granularity |  | REG bundle size |  |
|  | | REG bundle size |  | 6 |  |
| DRX | | |  | OFF |  |
| Gap pattern ID | | |  | N.A. |  |
| schedulingRequestID-BFR-r17 | | |  | Configured, 1-2 |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell | Config 1, 2, 4, 5 | | slot | 5 | 5ms |
| Config 3, 6 | |  | 10 |  |
| schedulingRequestID-BFR2-r17 | | |  | absent | When the field is absent, the random access procedure will be triggered for TRP BFR |
| Periodicity of PUCCH for SR configuration for BFR on TRP0 | | | Slot | 5 |  |
| SSB Index assigned as CBD RS (q10) in activated SCell | | |  | 1 |  |
| SSB Index assigned as CBD RS (q11) in activated SCell | | |  | 3 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. |
| rsrp-  ThresholdBFR | Config 1, 2, 4, 5 | | dBm/SCS | -98 | Threshold used for Qin\_LR\_SSB |
| Config 3, 6 | | -95 |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| BFD-RS (CSI-RS) | | Config 1, 4 |  | CSI-RS.1.2 FDD | A.1.4 |
| configuration for q00 in activated SCell | | Config 2, 5 |  | CSI-RS.1.2 TDD |  |
|  | | Config 3, 6 |  | CSI-RS.2.2 TDD |  |
| BFD-RS (CSI-RS)  configuration for q01 in activated SCell | | Config 1, 4 |  | CSI-RS.1.7 FDD | A.1.4 |
| Config 2, 5 | CSI-RS.1.6 TDD |
| Config 3, 6 | CSI-RS.2.7 TDD |
| CSI-RS | | Config 1, 4 |  | CSI-RS.1.1 FDD | A.1.4 |
| configuration for | | Config 2, 5 |  | CSI-RS.1.1 TDD |  |
| CSI reporting | | Config 3, 6 |  | CSI-RS.2.1 TDD |  |
| TRS configuration | | Config 1, 4 |  | TRS.1.1 FDD |  |
|  | | Config 2, 5 |  | TRS.1.1 TDD |  |
|  | | Config 3, 6 |  | TRS.1.2 TDD |  |
| csi-RS-Index | | Config 1, 4 |  | CSI-RS.1.2 FDD | A.1.4 |
| assigned as RLM | | Config 2, 5 |  | CSI-RS.1.2 TDD |  |
| RS in PSCell | | Config 3, 6 |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 0.18 |  |
| T3 | | | s | 0.14 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 0.17 |  |
| D1 | | | s | 0.06 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

4.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 4.5.5.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 4.5.5.8.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 4.5.5.8.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 4.5.5.8.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 4.5.5.8.5-1. T5 starts.

7. If the SS:

a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1,0 and q1,1 on the PCell before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1,0 and q1,1 on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

4.5.5.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.8.4.3-1: Common Exception messages for TRP specific EN-DC FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition SSB BFD  Table H.3.1-10 with Condition SSB CBD |

Table 4.5.5.8.4.3-2: *MAC-CellGroupConfig for R17 BFR*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1, Table 4.6.3-68 |  |  |  |
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { |  |  |  |
| schedulingRequestID-BFR-r17 | Not present |  |  |
| schedulingRequestID-BFR2-r17 | Not present |  |  |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config |  |  |
| } |  |  |  |

4.5.5.8.5 Test requirements

Table 4.5.5.8.5-1: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell2 | TRP 0/1 Cell3 | | | | |
|  | |  | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  |  | | | | |
| SNR\_CSI-RS of set q00 | Config 1, 4 | dB | 5+TT | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
|  | Config 2, 5 |  | 5+TT | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
|  | Config 3, 6 |  | 5+TT | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
| SNR\_CSI-RS of set q01 | Config 1, 4 |  | 5+TT  5+TT  5+TT | 5+TT  5+TT  5+TT | 5+TT  5+TT  5+TT | 5+TT  5+TT  5+TT | 5+TT  5+TT  5+TT | 5+TT  5+TT  5+TT |
| Config 2, 5 |
| Config 3, 6 |
| SNR\_SSB of set q10 | Config 1, 4 | dB | -10+TT | -10+TT | -10+TT | 10+TT | 10+TT | 10+TT |
|  | Config 2, 5 |  | -10+TT | -10+TT | -10+TT | 10+TT | 10+TT | 10+TT |
|  | Config 3, 6 |  | -10+TT | -10+TT | -10+TT | 10+TT | 10+TT | 10+TT |
| SSB\_RP of set q10 | Config 1, 4 | dBm/SCS kHz | -108+TT | -108+TT | -108+TT | -88+TT | -88+TT | -88+TT |
|  | Config 2, 5 |  | -108+TT | -108+TT | -108+TT | -88+TT | -88+TT | -88+TT |
|  | Config 3, 6 |  | -105+TT | -105+TT | -105+TT | -85+TT | -85+TT | -85+TT |
|  | Config 1, 4 | dBm/15 kHz | -98+TT | -98+TT | | | | |
|  | Config 2, 5 |  | -98+TT | -98+TT | | | | |
|  | Config 3, 6 |  | -98+TT | -98+TT | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.8.4-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause in clause A.3.6. | | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure on both TRP0 and TRP 1 and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1,0 and q1,1.

For TRP0, no later than time point F occurring no later than D1 = 60ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1,0. The UE shall not transmit PUCCH with an LRR with the candidate beam set q1,0 earlier than time point B.

Test is concluded once the test equipment has received the BFR MAC CE from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### 4.5.6 Active BWP switch delay

#### 4.5.6.1 DCI-based and time-based active BWP switch

##### 4.5.6.1.0 Minimum conformance requirements

4.5.6.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of TBWPswitchDelay which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of TBWPswitchDelay which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of TBWPswitchDelay which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration TBWPswitchDelay after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in Table 4.5.6.1.0.1-1.

Table 4.5.6.1.0.1-1: BWP switch delay

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | BWP switch delay TBWPswitchDelay (slots) | |
| Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| NOTE 1: Depends on UE capability.  NOTE 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP:

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

If the BWP switch is triggered within DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within:

- TBWPswitchDelay, provided that the BWP switching request is received in any of the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs, or

- TBWPswitchDelay + 1, provided that the BWP switching request is received after the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 4.5.6.1.0.1-3, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 4.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 4.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay TBWPswitchDelay as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 4.5.6.1.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 4.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 4.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay TBWPswitchDelay as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

Table 4.5.6.1.0.1-2: interruption length X

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X (slots) |
|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| NOTE: Void. | | |

Table 4.5.6.1.0.1-3: Parameters which cause interruption other than SCS

|  |  |
| --- | --- |
| Parameters | Comment |
| *locationAndBandwidth* | From TS 38.331 [13] |
| *nrofSRS-Ports* |
| *maxMIMO-Layers-r16* |

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

DCI-based or timer-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

Uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell may cause an interruption on PCell or on activated SCell(s) in the MCG.

The starting time of interruption due to DCI-based or timer-based downlink BWP and/or uplink BWP switching or due to uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell is only allowed within the BWP switching delay TBWPswitchDelay as defined in clause 8.6.2 of TS 38.133 [6].

RRC-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

The interruption due to RRC-based downlink BWP and/or uplink BWP switching is allowed anywhere within the BWP switching delay (TRRCprocessingDelay + TBWPswitchDelayRRC) defined in clause 8.6.3 of TS 38.133 [6]. The interruption due to RRC-based downlink BWP and/or uplink BWP switching defined in this clause is applicable provided that:

- the RRC reconfiguration requires the UE to only switch its active BWP; and

- the BWP switching occurs on only one NR serving cell.

When BWP switch involves SCS changes:

- the UE is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PCell or NR SCell on which the BWP switching occurs.

Otherwise:

- the UE capable of per UE measurement gap [29] is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PSCell or NR SCell on which the BWP switching occurs;

- the UE capable of per FR measurement gap [29] is allowed to cause interruption on PCell or on any activated SCell(s) provided that the NR PSCell or NR SCell on which the BWP switching occurs belongs to FR1.

The interruption on PCell or on any activated SCell(s) shall not exceed:

- 1 subframe in synchronous EN-DC;

- 2 subframes in asynchronous EN-DC.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2, 8.2.1.2.7 and TS 36.133 [23] clause 7.32.2.7.

##### 4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

4.5.6.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS 36.133 [23] clause 7.32.2.7.

4.5.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards, supporting EN-DC, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

4.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.1.

4.5.6.1.1.4 Test description

4.5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.6.1.1.4.1-1.

Table 4.5.6.1.1.4.1-1: Supported test configurations for FR1 DCI-based DL  
active BWP switch in non-DRX in synchronous EN-DC

|  |  |
| --- | --- |
| Config | Description |
| 4.5.6.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in clause 4.5.6.1.1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.1.1.4.1-2.

Table 4.5.6.1.1.4.1-2: Initial conditions for FR1 DCI-based DL  
active BWP switch in non-DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 4.5.6.1.1.4.1-3.

2. Message contents are defined in clause 4.5.6.1.1.4.3.

3. The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

- UE is configured with a bwp-InactivityTimer timer value for PSCell.

Table 4.5.6.1.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

| Parameter | Unit | Value | Comment |
| --- | --- | --- | --- |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

4.5.6.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 4.5.6.1.1.4.1-3 and 4.5.6.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SSindicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.1.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send a DCI format 1\_1 command for PSCell DL BWP switch.

6. The UE shall receive the DCI format 1\_1 command in PSCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot (*i+*TBWPswitchDelay+k1); and

b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (*i+*TBWPswitchDelay+ 1 subframe + k); and

c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. If the UE sends valid ACK/NACK for the PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on PSCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PSCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part - BWP-1 on PSCell:

a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot (*j+*TBWPswitchDelay+k1); and

b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (*j+*TBWPswitchDelay+ 1 subframe + k); and

c) If the number of consecutive missing ACK/NACK for PCell is no more than 1

Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

9. Repeat steps 5-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

"*k*" is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

If all subtests pass, the test passes. If one subtest fails, the test fails.

4.5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.6.1.1.4.3-1: Common Exception messages for FR1 DCI-based  
DL active BWP switch in non-DRX in synchronous EN-DC

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

Table 4.5.6.1.1.4.3-1A: *RRCReconfiguration* (Step3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration SEQUENCE { |  |  |  | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.1.1.4.3-1B |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.6.1.1.4.3-1B: *CellGroupConfig* (Table 4.5.6.1.1.4.3-1A)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| cellGroupId | 1 |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex of NR PSCell |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 4.5.6.1.1.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.1.4.3-2: *ServingCellConfig* (Table 4.5.6.1.1.4.3-1B)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| initialDownlinkBWP SEQUENCE { |  |  |  |
| pdcch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pdsch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| radioLinkMonitoringConfig CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1  Table 4.5.6.1.1.4.3-3 |  |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2  Table 4.5.6.1.1.4.3-3 |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 |  |
| bwp-InactivityTimer | ms200 |  |  |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 |  |
| uplinkConfig SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { |  |  |  |
|  |  |  |  |
| pucch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pusch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| srs-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1  Table 4.5.6.1.1.4.3-4 |  |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2  Table 4.5.6.1.1.4.3-4 |  |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.1.4.3-3: *BWP-Downlink* (Table 4.5.6.1.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Downlink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 | BWP-1 | BWP1 |
|  | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 |  | BWP1 |
|  | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 |  | BWP2 |
| pdsch-ConfigCommon CHOICE { |  |  |  |
| setup | PDSCH-ConfigCommon | Table 4.5.6.1.1.4.3-8 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.1.4.3-4: *BWP-Uplink* (Table 4.5.6.1.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Uplink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 | BWP-1 | BWP1 |
|  | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
|  | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.1.4.3-5: *Void*

Table 4.5.6.1.1.4.3-6: *PDSCH-TimeDomainResourceAllocationList* (Table 4.5.6.1.1.4.3-8)

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries |  |  |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { |  | entry 1 |  |
| k0 | Not present |  |  |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { |  | entry 2 |  |
| k0 | Not present |  |  |
| mappingType | typeA |  |  |
| startSymbolAndLength | 72 | S=2, L=6 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { |  | entry 3 |  |
| k0 | TBWPswitchDelay | Defined in Table 4.5.6.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { |  | entry 4 |  |
| k0 | 1 |  | First DCI right after DCI-based BWP switch |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.1.4.3-7: *Void*



Table 4.5.6.1.1.4.3-8: *PDSCH-ConfigCommon* (Table 4.5.6.1.1.4.3-3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-ConfigCommon ::= SEQUENCE { |  |  |  |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 4.5.6.1.1.4.3-6 |  |
| } |  |  |  |

4.5.6.1.1.5 Test requirements

Tables 4.5.6.1.1.4.1-3 and 4.5.6.1.1.5-1 define the primary level settings including test tolerances.

Table 4.5.6.1.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter | | Unit | Cell 2 |
| --- | --- | --- | --- |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | 10 MHz: NRB,c = 52 |
| Config 2,5 | 10 MHz: NRB,c = 52 |
| Config 3,6 | 40 MHz: NRB,c = 106 |
| Active BWP ID | |  | 1, 2 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.2 Note 4 |
| Config 2,5 |
| Config 3,6 |
| Active DL BWP-1 Configuration | Config 1,4 |  | DLBWP.1.1 Note 4 |
| Config 2,5 |
| Config 3,6 |
| Active DL BWP-2 Configuration | Config 1,4 |  | DLBWP.1.3 Note 4 |
| Config 2,5 |
| Config 3,6 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.2 Note 4 |
| Config 2,5 |
| Config 3,6 |
| Active UL BWP-1 Configuration | Config 1,4 |  | ULBWP.1.1 Note 4 |
| Config 2,5 |
| Config 3,6 |
| Active UL BWP-2 Configuration | Config 1,4 |  | N/A |
| Config 2,5 | ULBWP.1.3 Note 4 |
| Config 3,6 | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 |  | CCR.1.2 FDD |
| Config 2,5 | CCR.1.2 TDD |
| Config 3,6 | CCR.2.4 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 |  | SSB.2 FR1 |
| SMTC Configuration |  |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| TRS Configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 |  | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | Config 1,2,4,5 | dBm/SCS | -104 |
| Config 3,6 | -101 |
| NocNote 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | -87 |
| Config 3,6 | -84 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Propagation Condition | |  | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | |

During T1, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+k1).

During T3, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*j+*TBWPswitchDelay+k1).

Where, k1 is the timing between DL data receiving and acknowledgement as specified in 38.214 [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of E-UTRA PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of E-UTRA PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in TS 36.133 [23] clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (*i+* TBWPswitchDelay+k1), (*j+* TBWPswitchDelay+k1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

##### 4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Editor’s Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.6.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirements for NR victim cell defined in TS 38.133 [6] clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [23].

4.5.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards, supporting EN-DC, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA.

4.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.2.

4.5.6.1.2.4 Test description

4.5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.6.1.2.4.1-1. Supported test configurations for NR SCell are shown in Table Table 4.5.6.1.2.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.6.1.2.4.1-1: Supported test configurations for FR1 DCI-based  
DL active BWP switch with SCell in non-DRX in synchronous EN-DC for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Config | Description |
| 4.5.6.1.2-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.2-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.2-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.2-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.2-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.2-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.  Note 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in clause 4.5.6.1.1.  Note 3: Void  Note 4: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | |

Table 4.5.6.1.2.4.1-1A: Supported test configurations for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in 4.5.6.1.1.  Note 3: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.1.2.4.1-2.

Table 4.5.6.1.2.4.1-2: Initial conditions for FR1 DCI-based DL active  
BWP switch with SCell in non-DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 4.5.6.1.2.4.1-3.

2. Message contents are defined in clause 4.5.6.1.2.4.3.

3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Annex A.6. Cell 2 and Cell 3 are configured according to clauses C.1.2 and C.1.3.

4. By step 4 of the test procedure:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.

- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in SCell.

- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in PSCell.

- UE is configured with a bwp-InactivityTimer timer value for SCell.

Table 4.5.6.1.2.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2, 3 | Two NR radio channel are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| Active SCell |  | Cell 3 | SCell on RF channel number 3. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | μs | 3 | Synchronous cells |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

4.5.6.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 4.5.6.1.2.4.1-3 and 4.5.6.1.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 3. This message also configures 2 different UE-specific bandwidth parts for Cell 3, BWP-1 and BWP-2,which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id* in SCell, and BWP-0 as the active DL BWP using *firstActiveDownlinkBWP-Id* in PSCell, according to Table 4.5.6.1.2.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send a DCI format 1\_1 command for SCell DL BWP switch.

6. The UE shall receive the DCI format 1\_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

a) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot (*i+*TBWPswitchDelay+k1); and

b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (*i+*TBWPswitchDelay+ 1 subframe + *k*); and

c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+ Interruption length + k1); and

d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1.

Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. If the UE sends valid ACK/NACK for the SCell on PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1, on SCell:

a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (*j+*TBWPswitchDelay+ 1 subframe + *k*); and

b) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot (*j+*TBWPswitchDelay+k1); and

c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+ Interruption length + k1); and

d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1.Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

9. Repeat steps 5-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell and PSCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.1.2.7-1.

*k* is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

k1 is the timing between NR DL data receiving and acknowledgement as specified in TS 38.214 [9].

If all subtests pass, the test passes. If one subtest fails, the test fails.

4.5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.6.1.2.4.3-1: Common Exception messages for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

Table 4.5.6.1.2.4.3-1A: *RRCReconfiguration* (Step 3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC\_SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration SEQUENCE { |  |  |  | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.1.2.4.3-1B |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.6.1.2.4.3-1B: *CellGroupConfig* (Table 4.5.6.1.2.4.3-1A)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell\_add | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| cellGroupId | 1 |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig | Table 4.5.6.1.2.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.2.4.3-2: *ServingCellConfig* (Table 4.5.6.1.2.4.3-1B)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| initialDownlinkBWP SEQUENCE { |  |  |  |
| pdcch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pdsch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| radioLinkMonitoringConfig CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1  Table 4.5.6.1.2.4.3-3 |  |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2  Table 4.5.6.1.2.4.3-3 |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 |  |
| bwp-InactivityTimer | ms200 |  |  |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 |  |
| } |  |  |  |

Table 4.5.6.1.2.4.3-3: *BWP-Downlink* (Table 4.5.6.1.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Downlink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 | BWP-1 | BWP1 |
|  | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 |  | BWP1 |
|  | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 |  | BWP2 |
| pdsch-ConfigCommon CHOICE { |  |  |  |
| setup | PDSCH-ConfigCommon | Table 4.5.6.1.2.4.3-9 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.2.4.3-4: *Void*

Table 4.5.6.1.2.4.3-5: Void

Table 4.5.6.1.2.4.3-6: *PDSCH-TimeDomainResourceAllocationList* (Table 4.5.6.1.2.4.3-9)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries |  |  |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { |  | entry 1 |  |
| k0 | Not present |  |  |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { |  | entry 2 |  |
| k0 | Not present |  |  |
| mappingType | typeA |  |  |
| startSymbolAndLength | 72 | S=2, L=6 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { |  | entry 3 |  |
| k0 | TBWPswitchDelay | Defined in Table 4.5.6.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { |  | entry 4 |  |
| k0 | 1 |  | First DCI right after DCI-based BWP switch |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.1.2.4.3-7: *Void*

Table 4.5.6.1.2.4.3-8: *Void*



Table 4.5.6.1.2.4.3-9: *PDSCH-ConfigCommon* (Table 4.5.6.1.2.4.3-3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-ConfigCommon ::= SEQUENCE { |  |  |  |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 4.5.6.1.2.4.3-6 |  |
| } |  |  |  |

4.5.6.1.2.5 Test requirements

Tables 4.5.6.1.2.4.1-3 and 4.5.6.1.2.5-1 and 4.5.6.1.2.5-2 define the primary level settings including test tolerances.

Table 4.5.6.1.2.5-1: NR Cell specific test parameters for NR PSCell for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | |  | Note 7 |
| BWoccupied | Config 1,2,4,5 | RB | 52 Note 5 |
|  | Config 3,6 |  | 106 Note 6 |
| Active BWP ID | |  | 0 |
| Initial DL BWP Configuration | |  | DLBWP.0.2 |
| Active DL BWP-0 Configuration | |  | DLBWP.0.2 |
| Active DL BWP-1 Configuration | |  | N.A. |
| Active DL BWP-2 Configuration | |  | N.A. |
| Initial UL BWP Configuration | |  | ULBWP.0.2 |
| Active UL BWP-0 Configuration | |  | ULBWP.0.2 |
| Active UL BWP-1 Configuration | |  | N.A. |
| Active UL BWP-2 Configuration | |  | N.A. |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 |  | CCR.1.2 FDD |
| Config 2,5 | CCR.1.2 TDD |
| Config 3,6 | CCR.2.4 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 5 |
|  | Config 3,6 |  | OP.1 Note 6 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.1 |
| TRS Configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 |  | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD |
| Antenna Configuration | |  | 1x2 |
| Propagation Condition | |  | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| Config 3,6 | dBm/38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table 4.5.6.1.2.5-2: NR Cell specific test parameters for NR SCell for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 3** |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
| ConfigSCell 3 | TDDConf.2.1 |
| BWchannel | |  | Note 7 |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 5 |
|  | ConfigSCell 3 |  | 106 Note 6 |
| Active BWP ID | |  | 1,2 |
| Initial DL BWP Configuration | |  | DLBWP.0.2 |
| Active DL BWP-0 Configuration | |  | N.A. |
| Active DL BWP-1 Configuration | |  | DLBWP.1.3 |
| Active DL BWP-2 Configuration | |  | DLBWP.1.1 |
| Initial UL BWP Configuration | |  | N.A. |
| Active UL BWP-0 Configuration | |  | N.A. |
| Active UL BWP-1 Configuration | |  | N.A. |
| Active UL BWP-2 Configuration | |  | N.A. |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | SR.1.1 FDD |
| ConfigSCell 2 | SR.1.1 TDD |
| ConfigSCell 3 | SR.2.1 TDD |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR.2.1 TDD |
| Dedicated CORESET parameters | ConfigSCell 1 |  | CCR.1.2 FDD |
| ConfigSCell 2 | CCR.1.2 TDD |
| ConfigSCell 3 | CCR.2.4 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 5 |
|  | ConfigSCell 3 |  | OP.1 Note 6 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
| ConfigSCell 3 | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.1 |
| TRS Configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
| ConfigSCell 2 |  | TRS.1.1 TDD |
| ConfigSCell 3 |  | TRS.1.2 TDD |
| Antenna Configuration | |  | 1x2 |
| Propagation Condition | |  | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+k1).

During T3, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DL slot (*j+*TBWPswitchDelay+k1).

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [23].

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell and PSCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+k1), (*j+*TBWPswitchDelay+k1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### 4.5.6.2 RRC-based active BWP switch

##### 4.5.6.2.0 Minimum conformance requirements

4.5.6.2.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

NR Slot length is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by on the cell where RRC-based BWP switch occurs. When a longer switching delay is allowed. Where is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

##### 4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

4.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.3.

4.5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards supporting EN-DC, BWP adaptation of at least 2BWPs.

4.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.2.1.

4.5.6.2.1.4 Test description

4.5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.6.2.1.4.1-1.

Table 4.5.6.2.1.4.1-1: Supported test configurations for FR1 RRC-based DL active BWP   
switch in non-DRX in synchronous EN-DC

|  |  |
| --- | --- |
| Config | Description |
| 4.5.6.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.6.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.2.1.4.1-2.

Table 4.5.6.2.1.4.1-2: Initial conditions for FR1 RRC-based DL active BWP   
switch in non-DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 4.5.6.2.1.4.1-3.

2. Message contents are defined in clause 4.5.6.2.1.4.3.

3. The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).

- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell

Table 4.5.6.2.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |

4.5.6.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG*\_*and*\_*SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 4.5.6.2.1.4.1-3 and 4.5.6.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 4.5.6.2.1.5-1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PSCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 4.5.6.2.1.5-1.T1 starts.

6. The UE shall receive the *RRCConnectionReconfiguration* in PSCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration:

7 If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot i+X+k1then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where,

- X = 26 for test configuration 4.5.6.2-1, 4.5.6.2-2, 4.5.6.2-4 and 4.5.6.2-5;

- X = 52 for test configuration 4.5.6.2-3 and 4.5.6.2-6.

8. After the SS receives the ACK/NACK in step 5) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 6 or step 7 fails, switch off and on the UE and go to step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the RRCConnectionReconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

4.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.6.2.1.4.3-1: Common Exception messages for FR1 RRC-based DL active   
BWP switch in non-DRX in synchronous EN-DC

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

Table 4.5.6.2.1.4.3-1A: *RRCReconfiguration* (Step 3, Step 5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
| Information Element | Value/remark | Comment | Condition | |
| RRCReconfiguration ::= SEQUENCE { |  |  |  | |
| criticalExtensions CHOICE { |  |  |  | |
| rrcReconfiguration SEQUENCE { |  |  |  | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.2.1.4.3-1B |  | |
| } |  |  |  | |
| } |  |  |  | |
| } |  |  |  | |

Table 4.5.6.2.1.4.3-1B: *CellGroupConfig* (Table 4.5.6.2.1.4.3-1A)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| cellGroupId | 1 |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex of NR PSCell |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 4.5.6.2.1.4.3-1C |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.2.1.4.3-1C: *ServingCellConfig* (Table 4.5.6.2.1.4.3-1B)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| initialDownlinkBWP SEQUENCE { |  |  |  |
| pdcch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pdsch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| radioLinkMonitoringConfig CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry |  |  |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1  Table 4.5.6.2.1.4.3-1D |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 |  |
| defaultDownlinkBWP-Id | 1 | BWP-1 |  |
| uplinkConfig SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { |  |  |  |
| pucch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pusch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| srs-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry |  |  |
| BWP-Uplink[1] | BWP-Uplink | entry 1  4.5.6.2.1.4.3-1E |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | BWP-1 |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.2.1.4.3-1D: *BWP-Downlink* (Table 4.5.6.2.1.4.3-1C)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Downlink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 |  | Step 3 |
|  | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 |  | Step 5 |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.2.1.4.3-1E: *BWP-Uplink* (Table 4.5.6.2.1.4.3-1C)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Uplink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 |  | Step 3 |
|  | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 |  | Step 5 |
| } |  |  |  |
| } |  |  |  |

Table 4.5.6.2.1.4.3-2: Void

4.5.6.2.1.5 Test requirements

Tables 4.5.6.2.1.4.1-3 and 4.5.6.2.1.5-1 define the primary level settings including test tolerances.

Table 4.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter | | | Unit | Cell 2 |
| --- | --- | --- | --- | --- |
| Frequency Range | | |  | FR1 |
| Duplex mode | | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | | Config 1,4 |  | 10 MHz: NRB,c = 52 |
| Config 2,5 | 10 MHz: NRB,c = 52 |
| Config 3,6 | 40 MHz: NRB,c = 106 |
| Active DL BWP ID | | |  | 1 |
| Initial DL BWP Configuration | | Config 1,4 |  | DLBWP.0.2Note4 |
| Config 2,5 |
| Config 3,6 |
| Initial UL BWP Configuration | | Config 1,4 |  | ULBWP.0.2Note4 |
| Config 2,5 |
| Config 3,6 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1,4 |  | DLBWP.1.3 Note4 |
| Config 2,5 |
| Config 3,6 |
| Active UL BWP-1 Configuration | Config 1,4 |  | ULBWP.1.3 Note4 |
| Config 2,5 |
| Config 3,6 |
| Final  Condition | Active DL BWP-1 Configuration | Config 1,4 |  | DLBWP.1.1 Note4 |
| Config 2,5 |
| Config 3,6 |
| Active UL BWP-1 Configuration | Config 1,4 |  | ULBWP.1.1 Note4 |
| Config 2,5 |
| Config 3,6 |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1,4 |  | CCR.1.2 FDD |
| Config 2,5 | CCR.1.2 TDD |
| Config 3,6 | CCR.2.4 TDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| SMTC Configuration | | |  | SMTC.1 |
| TRS Configuration | | Config 1,4 |  | TRS.1.1 FDD |
|  | | Config 2,5 |  | TRS.1.1 TDD |
|  | | Config 3,6 |  | TRS.1.2 TDD |
| Antenna Configuration | | |  | 1x2 |
| Propagation Condition | | |  | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| NocNote 2 | | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | | dBm/15 kHz | -87 |
| Ês/Iot | | | dB | 17 |
| Ês/Noc | | | dB | 17 |
| IoNote3 | | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | | |

During T1, the UE shall be ready for the reception of uplink grant on PSCell from the first DL slot occurs after the beginning of DL slot , and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot

Where,

TRRCprocessingDelay = 20 ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

TBWPSwitchDelayRRC = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 1ms for SCS = 15kHz, and NR slot length = 0.5 ms for SCS = 30kHz.

*k1* is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives

26 slots, for SCS = 15kHz,

52 slots, for SCS = 30kHz.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

### 4.5.7 PSCell addition and release delay

#### 4.5.7.0 Minimum conformance requirements

##### 4.5.7.0.1 NR PSCell Addition Delay Requirement

The requirements in this section shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving NR PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards NR PSCell no later than in subframe *n* + Tconfig PSCell:

Where:

Tconfig\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_DU + 2 ms

TRRC\_delay is the RRC procedure delay as specified in TS 36.331 [29].

Tprocessing is the SW processing time needed by UE, including RF warm up period. Tprocessing = 20 ms if NR PSCell is in FR1, Tprocessing = 40 ms if NR PSCell is in FR2.

Tsearch is the time for AGC settling and PSS/SSS detection.

- For NR PSCell in FR1: if the target cell is a known cell, Tsearch = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot ≥ -2 dB, then Tsearch = 3\* Trs ms;

- For NR PSCell in FR2: if the target cell is a known cell, Tsearch = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot ≥ -2 dB, then Tsearch = 24\* Trs ms.

T∆ is time for fine time tracking and acquiring full timing information of the target cell. T∆ = 1\*Trs ms for a known or unknown PSCell.

TPSCell\_DU is the delay uncertainty in acquiring the first available PRACH occasion in the NR PSCell. TPSCell\_DU is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the NR PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the NR PSCell configuration command:

- the UE has sent a valid measurement report for the NR PSCell being configured and

- One of the SSBs measured from the NR PSCell being configured remains detectable according to the cell identification conditions specified in section 9.3 of TS 38.133 [6],

- One of the SSBs measured from NR PSCell being configured also remains detectable during the NR PSCell configuration delay according to the cell identification conditions specified in section 9.3 of TS 38.133 [6].

otherwise it is unknown.

The PCell interruption specified in section 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

##### 4.5.7.0.2 NR PSCell Release Delay Requirement

The requirements in this section shall apply for a UE which is configured with PCell and NR PSCell, and may also be configured with one or more SCells and/or NR SCells.

Upon receiving NR PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 36.331 [29] no later than in subframe *n+* TRRC\_delay:

Where

TRRC\_delay is the RRC procedure delay as specified in TS 36.331 [29].

The PCell interruption specified in section 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

#### 4.5.7.1 EN-DC FR1 addition and release delay of known PSCell

4.5.7.1.1 Test purpose

The purpose of this test is to verify that the PSCell addition and release delay for an NR PSCell is within the specified limits and the CSI transmissions are according to the requirements.

4.5.7.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.7.0.1 and 4.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.7.1.

4.5.7.1.4 Test description

4.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.7.1.4.1-1.

Table 4.5.7.1.4.1-1: Test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.5.7.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.5.7.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.5.7.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.5.7.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.5.7.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.5.7.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.7.1.4.1-2.

Table 4.5.7.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.5.7.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4.5.7.1.4.1-3.

Table 4.5.7.1.4.1-3: General Test Parameters for PSCell Addition and Release

| Parameter | | Unit | Value | Comment |
| --- | --- | --- | --- | --- |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Neighbour cell | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | Cell1 | PCell on RF channel number 1. |
| Neighbour Cell | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| Threshold RSRP  (Config 1,2,4,5) | dBm | -99 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [23] into account plus margin. |
| Threshold RSRP  (Config 3,6) | dBm | -96 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [23] into account plus margin. |
| Time to Trigger | S | 0 |  |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | |  | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration on cell2 | |  | PRACH.1 FR1 | See A.7.1 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1.5 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 3 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |
| T4 | | s | 0.5 | During this time the UE adds the PSCell. |
| T5 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T6 | | s | 0.5 | During this time the UE releases the PSCell. |

4.5.7.1.4.2 Test procedure

1. Ensure the UE is in state E-UTRA RRC\_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 4.5.7.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration message* with event B1 configured.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall set T2 parameters according to Table 4.5.7.1.5-1 as appropriate. T2 starts.

6. The UE shall transmit a *MeasurementReport* message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2.

7. The SS shall transmit an *RRCConnectionReconfiguration* message to release measurement gap. T3 starts.

8. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

9. During T3 the SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG\_and\_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). T4 starts from the instant when the SS sends the last TTI containing the RRC message.

10. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

11. The UE shall send a PRACH to PSCell during T4. The UE shall send PRACH no later than 82ms from the start of T4, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.

12. T5 starts.

13. During T5 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.

14. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T6 starts from the instant when the SS sends the last TTI containing the RRC message.

15. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

17. Set Cell 2 physical cell identity = [((current cell 2 physical cell identity + 1) mod 1008)] for next iteration of the test procedure loop.

18. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC\_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 20, otherwise switches off the UE.

19. Switches on the UE and ensures the UE is in state E-UTRA RRC\_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

20. Repeat step 2-19 until a test verdict has been achieved.

4.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.7.1.4.3-1: Common exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 for step 3  Table H.3.4-1 for step 6.  Table H.3.4-4 with condition INTER-RAT NR and EVENT B1  Table H.3.4-5 with condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.5.7.1-1, 4.5.7.1-2, 4.5.7.1-4, 4.5.7.1-5 | Table H.3.4-6 with condition SMTC.1 and SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 4.5.7.1-3, 4.5.7.1-6 | Table H.3.4-6 with condition SMTC.1 and SSB.2 FR1 |

Table 4.5.7.1.4.3-2: Void

Table 4.5.7.1.4.3-3: Void

4.5.7.1.5 Test requirements

Table 4.5.7.1.5-1 defines the primary level settings including test tolerances.

Table 4.5.7.1.5-1: Cell Specific Parameters for PSCell Addition and Release

| Parameter | Unit | Config | Test | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T4 | T5 | T6 |
| E-UTRA RF Channel Number |  | 1,2,3,4,5,6 | 1 | | | | | |
| NR RF Channel Number |  | 1,2,3,4,5,6 | 2 | | | | | |
| TDD configuration |  | 1,4 | Not Applicable | | | | | |
| 2,5 | TDDConf.1.1 | | | | | |
| 3,6 | TDDConf.2.1 | | | | | |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 | | | | | |
| 2,5 | 10: NRB,c = 52 | | | | | |
| 3,6 | 40: NRB,c = 106 | | | | | |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 | | | | | |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 | | | | | |
| PDSCH Reference measurement channel |  | 1,4 | SR.1.1 FDD | | | | | |
| 2,5 | SR.1.1 TDD | | | | | |
| 3,6 | SR.2.1 TDD | | | | | |
| RMSI CORESET Reference Channel |  | 1,4 | CR.1.1 FDD | | | | | |
| 2,5 | CR.1.1 TDD | | | | | |
| 3,6 | CR.2.1 TDD | | | | | |
| Dedicated CORESET Reference Channel |  | 1,4 | CCR.1.1 FDD | | | | | |
| 2,5 | CCR.1.1 TDD | | | | | |
| 3,6 | CCR.2.1 TDD | | | | | |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 | | | | | |
| SSB configuration |  | 1,2,4,5 | SSB.1 FR1 | | | | | |
| 3,6 | SSB.2 FR1 | | | | | |
| SMTC configuration |  | 1,2,4,5 | SMTC.1 | | | | | |
| 3,6 | SMTC.1 | | | | | |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | | | | | |
|  | 2,5 | TRS.1.1 TDD | | | | | |
|  | 3,6 | TRS.1.2 TDD | | | | | |
| CSI-RS configuration for CSI reporting |  | 1,4 | CSI-RS.1.1 FDD | | | | | |
| 2,5 | CSI-RS.1.1 TDD | | | | | |
| 3,6 | CSI-RS.2.1 TDD | | | | | |
| reportConfigType |  | 1,2,3,4,5,6 | periodic | | | | | |
| reportQuantity |  | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | | | |
| 3,6 | 10 | | | | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | | | |
| 3,6 | 4 | | | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Note2 | dBm/15 kHz | 1,2,4,5 | N/A | -88.6 | | | | |
| 3,6 | N/A | -88.6 | | | | |
| Note2 | dBm/SCS | 1,2,4,5 | N/A | -88.6 | | | | |
| 3,6 | N/A | -85.6 | | | | |
|  |  | 1,2,3,4,5,6 | -infinity | 0 | | | | |
|  |  | 1,2,3,4,5,6 | -infinity | 0 | | | | |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -infinity | -88.6 | | | | |
| 3,6 | -infinity | -85.6 | | | | |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | N/A | -57.6 | | | | |
| dBm/38.1MHz | 3,6 | N/A | -51.5 | | | | |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN | | | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | |

The UE shall transmit the PRACH to PSCell no later than 82 msNote1 from the start of T4.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T5.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T5.

The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

NOTE: The PSCell addition delay can be expressed as follows as specified in clause 4.7.5.0.1:

Tconfig\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_ DU + 2ms

Where:

TRRC\_delay = 20ms

Tprocessing = 20ms

Tsearch = 0

T∆ = 20ms

TPSCell\_ DU = 1\*10+10 = 20ms

### 4.5.8 UL switching

#### 4.5.8.0 Minimum conformance requirements

[TS 38.133, clause 8.2.1.2.14]

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where E-UTRA UL carrier is capable of one transmit antenna connector and NR UL carrier is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in NR carrier. The DL interruption lengths of X for NR carrier(s) are defined in Table 4.5.8.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band EN-DC configurations as specified in clause 5.5B.4 of TS 38.101-3 [4].

Table 4.5.8.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Uplink Tx switching period Note1 | |
|  |  | 35us | 140us |
| 0 | 1 | 2 | 3 |
| 1 | 0.5 | 3 | 6 |
| 2 | 0.25 | 4 | 10 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod.* | | | |

#### 4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers

4.5.8.1.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers. The test case is applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present.

4.5.8.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards supporting dynamic UL Tx switching in case of inter-band EN-DC.

4.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.8.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.8.

4.5.8.1.4 Test description

4.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.8.1.4.1-1.

Table 4.5.8.1.4.1-1: Test configurations

|  |  |
| --- | --- |
| Test Case ID | PSCell (Cell2) |
| 4.5.8.1-1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 4.5.8.1.4.1-2.

Table 4.5.8.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.8.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.5.8.1.4.1-3

2. Message contents are defined in clause 4.5.8.1.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in Annex C.1.1.

Table 4.5.8.1.4.1-3: General Test Parameters for DL Interruptions at switching between two uplink carriers in EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2 | Two radio channels are used for the test. |
| Active cell |  | Config 1 | Cell 1: E-UTRAN FDD PCell  Cell 2: FR1 PSCell | E-UTRAN FDD PCell on RF channel number 1  FR1 PSCell on RF channel number 2 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | OFF |  |
| Measurement gap pattern Id |  | Config 1 | OFF |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting |  | Config 1 | CSI-RS.2.5 TDD |  |
| T1 | s | Config 1 | 5 |  |

4.5.8.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is E-UTRAN PCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and *uplinkTxSwitching* is indicated to the UE.

UE is configured to transmit SRS on PSCell on the last 2 symbols of special slot. DL interruption is expected to take place prior of the SRS symbols.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG\_and\_SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 4.5.8.1.4.3. *UplinkTxSwitching* is configured to the UE.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. Set the parameters according to T1 in Tables 4.5.8.1.5-1. T1 starts.

6. SS schedules UL transmission on PCell continuously on the DL slots of PSCell.

7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting (6dB) on following symbol on the special slot on PSCell.

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,

- symbol#5 if UE capability uplinkTxSwitchingPeriod is 140us or

- symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.

8. After 80ms from the aperiodic CSI-RS transmission, the SS transmits the DCI trigger. The UE shall send L1-RSRP report containing L1-RSRP of CSI-RS#0 at slot 5 from the reception of DCI trigger, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any of the reconfigurations fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

12. Repeat step 3-11 until a test verdict has been achieved.

4.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.8.1.4.3-1: Common exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-5 |

Table 4.5.8.1.4.3-2: CellGroupConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| uplinkTxSwitchingOption-r16 | switchedUL |  | UE reports ‘*switchedUL*’ or ‘*both*’ for capability IE *uplinkTxSwitching-OptionSupport-r16* |
|  | dualUL |  | UE reports ‘*dualUL’* for capability IE *uplinkTxSwitching-OptionSupport-r16* |
| } |  |  |  |

Table 4.5.8.1.4.3-3: ServingCellConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkTxSwitching-r16 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| uplinkTxSwitchingPeriodLocation-r1 | 1 |  |  |
| uplinkTxSwitchingCarrier-r16 | carrier2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.8.1.4.3-4: TDD-UL-DL-ConfigCommon

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table 7.3.1-1 with condition TDDConf.2.1 | | | |
| Information Element | Value/remark | Comment | Condition |
| TDD-UL-DL-ConfigCommon ::= SEQUENCE { |  |  |  |
| pattern1 SEQUENCE { |  |  |  |
| nrofDownlinkSymbols | 11 |  |  |
| nrofUplinkSymbols | 2 |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.8.1.4.3-5: SRS-Config

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
| Information Element | Value/remark | Comment | Condition |
| SRS-Config ::= SEQUENCE { |  |  |  |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { |  |  |  |
| SRS-ResourceSet[1] SEQUENCE { |  | entry 1 |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { |  |  |  |
| SRS-Resource[1] SEQUENCE { |  | entry 1 |  |
| nrofSRS-Ports | ports2 |  |  |
| resourceMapping SEQUENCE { |  |  |  |
| startPosition | 1 |  |  |
| nrofSymbols | n2 |  |  |
| } |  |  |  |
| freqHopping SEQUENCE { |  |  |  |
| c-SRS | 0 |  |  |
| } |  |  |  |
| groupOrSequenceHopping | neither |  |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| periodicityAndOffset-p CHOICE { |  |  |  |
| sl8 | 3 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.8.1.4.3-6: *CSI-MeasConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-38 | | | |
| Information Element | Value/remark | Comment | Condition |
| CSI-MeasConfig::= SEQUENCE { |  |  |  |
| nzp-CSI-RS-ResourceToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource { | 1 entry |  |  |
| NZP-CSI-RS-Resource[1] SEQUENCE { |  | entry 1 |  |
| nzp-CSI-RS-ResourceId | 0 |  |  |
| resourceMapping SEQUENCE { |  |  |  |
| frequencyDomainAllocation CHOICE { |  |  |  |
| other | 000001 |  |  |
| } |  |  |  |
| nrofPorts | p1 |  |  |
| firstOFDMSymbolInTimeDomain | 10 |  | UE does not report uplinkTxSwitching-DL-Interruption-r16 |
|  | 5 |  | UE capability uplinkTxSwitchingPeriod is 140us |
|  | 8 |  | UE capability uplinkTxSwitchingPeriod is 35us |
| firstOFDMSymbolInTimeDomain2 | Not present |  |  |
| cdm-Type | noCDM |  |  |
| density CHOICE { |  |  |  |
| three |  |  |  |
| } |  |  |  |
| freqBand SEQUENCE { |  |  |  |
| startingRB | 0 |  |  |
| nrofRBs | 106 |  |  |
| } |  |  |  |
| } |  |  |  |
| powerControlOffset | 0 |  |  |
| powerControlOffsetSS | db0 |  |  |
| scramblingID | 0 |  |  |
| periodicityAndOffset | Not Present |  |  |
| qcl-InfoPeriodicCSI-RS | Not Present |  |  |
| } |  |  |  |
| } |  |  |  |
| nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSets)) OF NZP-CSI-RS-ResourceSetId { | 1 entry |  |  |
| NZP-CSI-RS-ResourceSet[1] | NZP-CSI-RS-ResourceSet | entry 1  Table 4.5.8.1.4.3-7 |  |
| } |  |  |  |
| csi-ResourceConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig { | 1 entry |  |  |
| CSI-ResourceConfig[1] |  | entry 1  Table 4.5.8.1.4.3-8 |  |
| } |  |  |  |
| csi-ReportConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfig { | 1 entry |  |  |
| CSI-ReportConfig[1] | CSI-ReportConfig | entry 1  Table 4.5.8.1.4.3-9 |  |
| } |  |  |  |
| } |  |  |  |

Table 4.5.8.1.4.3-7: *NZP-CSI-RS-ResourceSet*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-87 | | | |
| Information Element | Value/remark | Comment | Condition |
| NZP-CSI-RS-ResourceSet ::= SEQUENCE { |  |  |  |
| nzp-CSI-ResourceSetId | 0 |  |  |
| nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId { | 1 entry |  |  |
| NZP-CSI-RS-ResourceId[1] | 0 | entry 1 |  |
| } |  |  |  |
| repetition | off |  |  |
| aperiodicTriggeringOffset | 6 |  |  |
| trs-Info | Not present |  |  |
| } |  |  |  |

Table 4.5.8.1.4.3-8: *CSI-ResourceConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-41 | | | |
| Information Element | Value/remark | Comment | Condition |
| CSI-ResourceConfig ::= SEQUENCE { |  |  |  |
| csi-ResourceConfigId | 0 |  |  |
| csi-RS-ResourceSetList CHOICE { |  |  |  |
| nzp-CSI-RS-SSB SEQUENCE { |  |  |  |
| nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF NZP-CSI-RS-ResourceSetId { |  |  |  |
| NZP-CSI-RS-ResourceSetId [1] | 0 |  |  |
| } |  |  |  |
| csi-SSB-ResourceSetList | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| bwp-Id | 0 |  |  |
| resourceType | aperiodic |  |  |
| } |  |  |  |

Table 4.5.8.1.4.3-9: *CSI-ReportConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-39 | | | |
| Information Element | Value/remark | Comment | Condition |
| CSI-ReportConfig ::= SEQUENCE { |  |  |  |
| reportConfigId | 0 |  |  |
| carrier | ServCellIndex |  |  |
| resourcesForChannelMeasurement | 0 |  |  |
| csi-IM-ResourcesForInterference | Not present |  |  |
| nzp-CSI-RS-ResourcesForInterference | Not present |  |  |
| reportConfigType CHOICE { |  |  |  |
| Aperiodic SEQUENCE { |  |  |  |
| reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF INTEGER { |  |  |  |
| INTEGER | 5 |  |  |
| INTEGER | 5 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportQuantity CHOICE { |  |  |  |
| cri-RSRP | NULL |  |  |
| } |  |  |  |
| reportFreqConfiguration | Not present |  |  |
| timeRestrictionForChannelMeasurements | Not present |  |  |
| timeRestrictionForInterferenceMeasurements | Not present |  |  |
| codebookConfig | Not present |  |  |
| dummy | Not present |  |  |
| groupBasedBeamReporting | Not present |  |  |
| cqi-Table | Not present |  |  |
| subbandSize | Not present |  |  |
| non-PMI-PortIndication | Not present |  |  |
| semiPersistentOnPUSCH-v1530 | Not present |  |  |
| semiPersistentOnPUSCH-v1610 | Not present |  |  |
| aperiodic-v1610 SEQUENCE { |  |  |  |
| reportSlotOffsetListDCI-0-2-r16 | Not present |  |  |
| reportSlotOffsetListDCI-0-1-r16 SEQUENCE (SIZE (1..maxNrofUL-Allocations-r16)) OF INTEGER { |  |  |  |
| INTEGER | 5 |  |  |
| INTEGER | 5 |  |  |
| } |  |  |  |
| } |  |  |  |
| reportQuantity-r16 | Not present |  |  |
| codebookConfig-r16 | Not present |  |  |
| } |  |  |  |

4.5.8.1.5 Test requirements

Table 4.5.8.1.5-1 defines the NR cell specific primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions at switching between two uplink carriers.

Table 4.5.8.1.5-1: NR Cell specific test parameters for DL Interruptions at switching between two uplink carriers in EN-DC (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1 |  | TDD |
| TDD configuration | Config 1 |  | TDDConf.2.1 except that:  S=’11DL: 1GP:2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* |
| BWchannel | Config 1 |  | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 |
| UL dedicated BWP configuration |  |  | ULBWP.1.1 |
| SRS configuration |  |  | SRSConf.4 in Table 4.5.8.1.5-2 |
| PDSCH Reference measurement channel | Config 1 |  | SR.2.1 TDD |
| RMSI CORESET parameters | Confiq 1 |  | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 2x2 low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/SCS | 84 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| NocNote 2 | Config 1 | dBm/SCS | -101 |
| IoNote3 | Config 1 | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1 Note 5 | | μs | 0 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | |

Table 4.5.8.1.5-2: SRS Configuration for DL Interruptions at switching between two uplink carriers

|  |  |  |  |
| --- | --- | --- | --- |
|  | Field | SRSConf.4 | Comments |
| SRS- | srs-ResourceSetId | 0 |  |
| ResourceSet | srs-ResourceIdList | 0 |  |
|  | resourceType | Periodic |  |
|  | Usage | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 |  |
|  | nrofSRS-Ports | Port2 |  |
|  | transmissionComb | n2 |  |
|  | combOffset-n2 | 0 |  |
|  | cyclicShift-n2 | 0 |  |
|  | resourceMapping  startPosition | 1 |  |
|  | resourceMapping  nrofSymbols | n2 |  |
|  | resourceMapping  repetitionFactor | n1 |  |
|  | freqDomainPosition | 0 |  |
|  | freqDomainShift | 0 |  |
|  | freqHopping  c-SRS | 0 | Matches NRB,c |
|  | freqHopping  b-SRS | 0 |  |
|  | freqHopping  b-hop | 0 |  |
|  | groupOrSequenceHopping | Neither |  |
|  | resourceType | Periodic |  |
|  | periodicityAndOffset-p | sl8, 3 | Offset to align with DRx periodicity |
|  | sequenceId | 0 | Any 10 bit number |

The UE shall send L1-RSRP report at slot 5 from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.5.8.1.5-3.

Table 4.5.8.1.5-3: L1-RSRP absolute accuracy requirements for the reported values

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#0) | 62 |
| Highest reported value (CSI-RS#0) | 83 |

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.6 Measurement procedures

### 4.6.1 Intra-frequency measurements

#### 4.6.1.0 Minimum conformance requirements

##### 4.6.1.0.1 Minimum conformance requirements for event-triggered reporting without gap

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra) ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 4.6.1.0.1-1, 4.6.1.0.1-2, 4.6.1.0.1-4 (deactivated SCell) or 4.6.1.0.1-5 (deactivated SCell)

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 4.6.1.0.1-3 or 4.6.1.0.1-6 (deactivated SCell)

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 4.6.1.0.1-7, table 4.6.1.0.1-8, table 4.6.1.0.1-9 (deactivated Scell), 4.6.1.0.1-10(deactivated SCell), or 4.6.1.0.1-11 ()

CSSFintra: it is a carrier specific scaling factor and is determined

* according to CSSFoutside\_gap,i in TS 38.133 [6] section 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intrafrequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to CSSFwithin\_gap,i in TS 38.133 [6] section 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intrafrequency SMTC is fully overlapping with measurement gaps.
* if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

Mpss/sss\_sync\_w/o\_gaps: For a UE supporting FR2 power class 1, Mpss/sss\_sync=40. For a UE supporting power class 2, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2 power class 3, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2 power class 4, Mpss/sss\_sync\_w/o\_gaps = 24

Mmeas\_period\_w/o\_gaps: For a UE supporting power class 1, Mmeas\_period\_w/o\_gaps =40. For a UE supporting FR2 power class 2, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 3, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 4, Mmeas\_period\_w/o\_gaps = 24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index

For FR2,

Klayer1\_measurement=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged.and RSSI symbols are indicated by *SS-RSSI-Measurement*;

Klayer1\_measurement=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 4.6.1.0.1-1, Table 4.6.1.0.1-2, Table 4.6.1.0.1-3, Table 4.6.1.0.1-4, Table 4.6.1.0.1-5 and Table 4.6.1.0.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 Note 2x 5 x Kp) x max(SMTC period, DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraRAT-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.  NOTE 4: When highSpeedMeasCA-Scell-r17 is configured and UE supports measurementEnhancementCA-r17, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |

Table 4.6.1.0.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x K layer1\_measurement)x SMTC period) note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5 x Mpss/sss\_sync\_w/o\_gaps x Kp x K layer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x K layer1\_measurement) x DRX cycle x CSSFintra |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

Table 4.6.1.0.1-3: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 Note 2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.  NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.  NOTE 4: When highSpeedMeasCA-Scell-r17 is configured and UE supports measurementEnhancementCA-r17, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 | |

Table 4.6.1.0.1-4: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | 5 x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | 5 x max(measCycleSCell, DRX cycle) x CSSFintra |

Table 4.6.1.0.1-5: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Mpss/sss\_sync\_w/o\_gaps x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Mpss/sss\_sync\_w/o\_gaps x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Mpss/sss\_sync\_w/o\_gaps x max(measCycleSCell, DRX cycle) x CSSFintra |

Table 4.6.1.0.1-6: Time period for time index detection, deactivated SCell (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | 3 x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | 3 x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | 3 x max(measCycleSCell, DRX cycle) x CSSFintra |

Table 4.6.1.0.1-7: Time period for PSS/SSS detection, deactivated SCell (FR1), when *highSpeedMeasCA-Scell-r17* is configured

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Ceil(5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCycleSCell, M2 Note 1xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 | |

Table 4.6.1.0.1-8: Time period for time index detection, deactivated SCell (FR1)，when *highSpeedMeasCA-Scell-r17* is configured

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | Ceil(3 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(3 x Kp) x max(measCycleSCell, M2 Note 1xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(3 x Kp)x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 | |

The measurement period for intra-frequency measurements without gaps is as shown in table 4.6.1.0.1-9, 4.6.1.0.1-10, 4.6.1.0.1-11 (deactivated SCell) or 4.6.1.0.1-12 (deactivated SCell). When *highSpeedMeasFlag-r16* is configured, T SSB\_measurement\_period\_intra is specified in Table 4.6.1.0.1-13.

If the higher layer signalling in TS38.331 [13] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for TSSB\_measurement\_period\_intra.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 4.6.1.0.1-7, Table 4.6.1.0.1-10, Table 4.6.1.0.1-11 and Table 4.6.1.0.1-12 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

Table 4.6.1.0.1-9: Measurement period for intrafrequency measurements without gaps  
(Frequency FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_measurement\_period\_intra |
| No DRX | max( 200ms, ceil( 5 x Kp) x SMTC period ) Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 200ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil( 5 x Kp ) x DRX cycle x CSSFintra |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

Table 4.6.1.0.1-10: Measurement period for intrafrequency measurements without gaps  
(Frequency FR2)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_measurement\_period\_intra |
| No DRX | max( 400ms, ceil(Mmeas\_period\_w/o\_gaps x Kp x K layer1\_measurement) x SMTC period) Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 400ms, ceil(1.5x Mmeas\_period\_w/o\_gaps x Kp x K layer1\_measurement) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mmeas\_period\_w/o\_gaps xKp x K layer1\_measurement ) x DRX cycle x CSSFintra |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

Table 4.6.1.0.1-11: Measurement period for intrafrequency measurements without gaps  
(deactivated SCell) (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_measurement\_period\_intra |
| No DRX | 5 x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | 5 x max(measCycleSCell, DRX cycle) x CSSFintra |

Table 4.6.1.0.1-12: Measurement period for intrafrequency measurements without gaps  
(deactivated SCell) (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_measurement\_period\_intra |
| No DRX | Mmeas\_period with\_gaps x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Mmeas\_period with\_gaps x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Mmeas\_period with\_gaps x max(measCycleSCell, DRX cycle) x CSSFintra |

Table 4.6.1.0.1-13: T SSB\_measurement\_period\_intra When *highSpeedMeasFlag-r16* is configured  
(Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_measurement\_period\_intra |
| No DRX Note 2 | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 160ms | max(200ms, ceil(5 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle) x CSSFintra |
| DRX cycle>320ms | ceil( Y Note 3 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.  NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.  NOTE 3: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms.  NOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.  NOTE 5: When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to measurements of secondary component carrier with active SCell. | |

Table 4.6.1.0.1-14: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1), when highSpeedMeasCA-Scell-r17 is configured

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra |
| No DRX | ceil( 5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 160ms | ceil(5 x Kp) x max(measCycleSCell, M2 Note 1 x DRX cycle) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(4 x Kp) x max(measCycleSCell, M2 Note 1 x DRX cycle) |
| DRX cycle>320ms | ceil( Y Note 2 x Kp ) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1  NOTE 2: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms | |

The normative reference for this requirement is TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

##### 4.6.1.0.2 Minimum conformance requirements for event-triggered measurements with gap

TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra ms

Tidentify\_intra\_with\_index = TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 4.6.1.0.2 or 4.6.1.0.2.

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 4.6.1.0.2.

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 4.6.1.0.2 or 4.6.1.0.2.

CSSFintra: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in TS 38.133 [6] section 9.1.5.2 for measurement conducted within measurement gaps.

Mpss/sss\_sync\_with\_gaps : For a UE supporting FR2 power class 1, Mpss/sss\_sync with\_gaps=40. For a UE supporting FR2 power class 2, Mpss/sss\_sync with\_gaps =24. For a UE supporting FR2 power class 3, Mpss/sss\_sync with\_gaps =24. For a UE supporting power class 4, Mpss/sss\_sync with\_gaps =24

Mmeas\_period\_with\_gaps: For a UE supporting power class 1, Mmeas\_period\_with\_gaps =40. For a UE supporting power class 2, Mmeas\_period\_with\_gaps =24. For a UE supporting power class 3, Mmeas\_period\_with\_gaps =24. For a UE supporting power class 4, Mmeas\_period with\_gaps =24.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index.

If SCG DRX is in use, intrafrequency cell identification requirements specified in TS 38.133 [6] Table 9.2.6.1-1, Table 9.2.6.1-2, and Table 9.2.5.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.2: Time period for PSS/SSS detection (Frequency range FR1)

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | max(600ms, 5 x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x CSSFintra |

Table 4.6.1.0.2-2: Time period for PSS/SSS detection (Frequency range FR2)

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | max(600ms, Mpss/sss\_sync\_with\_gaps x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x Mpss/sss\_sync\_with\_gaps) x max(MGRP, SMTC period, DRX cycle))x CSSFintra |
| DRX cycle>320ms | Mpss/sss\_sync\_with\_gaps x max(MGRP, DRX cycle) x CSSFintra |

Table 4.6.1.0.2: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| **DRX cycle** | **TSSB\_time\_index\_intra** |
| No DRX | max(120ms, 3 x max(MGRP, SMTC period) ) x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil(1.5x 3) x max(MGRP, SMTC period,DRX cycle) x CSSFintra) |
| DRX cycle>320ms | 3 x max(MGRP, DRX cycle) x CSSFintra |

[TS 38.133, clause 9.2.6.3]

The measurement period for FR1 intrafrequency measurements with gaps is as shown in Table 4.6.1.0.2-4.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in Table 4.6.1.0.2-5.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 4.6.1.0.2-4 and Table 4.6.1.0.2-5, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.2-4: Measurement period for intrafrequency measurements with gaps  
(Frequency Range FR1)

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | Max(200ms, 5 x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle))x CSSFintra |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x CSSFintra |

Table 4.6.1.0.2-5: Measurement period for intrafrequency measurements with gaps  
(Frequency Range FR2)

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | max(400ms, Mmeas\_period with\_gaps x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x Mmeas\_period with\_gaps) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSFintra |
| DRX cycle>320ms | Mmeas\_period with\_gaps x max(MGRP, DRX cycle) x CSSFintra |

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] sections 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T identify intra with index or T identify intra without index defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify intra without index or Tidentify intra with index defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than TMeasurement\_Period, Intra provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.6.2, 9.2.6.3 and 9.2.4.3.

#### 4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX

4.6.1.1.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap within the intra-frequency cell search requirements.

4.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.1.

4.6.1.1.4 Test description

4.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.1.4.1-1.

Table 4.6.1.1.4.1-1: supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.6.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.1.4.1-2 and Table 4.6.1.1.4.1-3.

Table 4.6.1.1.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting  
without gap for PSCell in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

Table 4.6.1.1.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting  
without gap for PSCell in FR1

| Parameter | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- |
| Active cell |  | 1, 2, 3 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1, 2, 3 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| Hysteresis | dB | 1, 2, 3 | 0 |  |
| Time To Trigger | s | 1, 2, 3 | 0 |  |
| Filter coefficient |  | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX |  | 1, 2, 3 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1, 2, 3 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 5 |  |

1. Message contents are defined in clause 4.6.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (Cell 1) and PSCell (Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.1.4.3.

4. Set the parameters according to T1 in Table 4.6.1.1**.**4.1**-**2. Propagation conditions are set according to Annex C clauses C.2.2

5. The SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

6. The UE shall transmit an RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.1**.**4.1**-**2.

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than 802 the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

9. The SS waits until the MeasurementReport message is received or when T2 expires.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 1) mod 14 + 2)] for next iteration of the test procedure loop.

12. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

14. Repeat steps 3-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.1.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in non-DRX test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-4 |
| Specific message contents exceptions for Test Configuration 4.6.1.1-1 and 4.6.1.1-4 | Table H.3.1-3 with Condition SSB.1 FR1Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.1-2 and 4.6.1.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.1-3 and 4.6.1.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

4.6.1.1.5 Test requirement

Table 4.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.1.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | | T2 |
| TDD configuration |  | 1 | N/A | | N/A | | |
| 2 | TDDConf.1.1 | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | | |
| 2 | SR.1.1 TDD | |
| 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | CR.1.1 FDD | | |
| 2 | CR.1.1 TDD | | CR.1.1 TDD | | |
| 3 | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | | |
| 2 | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| 3 | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | | N/A | |
| 2 | TRS.1.1 TDD | | | N/A | |
| 3 | TRS.1.2 TDD | | | N/A | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | | |
| note 2 | dBm/SCS | 1 | -98 | | | | |
| 2 | -98 | | | | |
| 3 | -95 | | | | |
| note 2 | dBm/15 kHz | 1 | -98 | | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | -1.46 | -Infinity | | -1.46 |
| 2 |
| 3 |
|  | dB | 1 | 4 | 4 | -Infinity | | 4 |
| 2 |
| 3 |
| SS-RSRP note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | | -94 |
| 2 | -94 | -94 | -Infinity | | -94 |
| 3 | -91 | -91 | -Infinity | | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -Infinity | | -62.25 |
| dBm/9.36 MHz | 2 | -64.60 | -62.25 | -Infinity | | -62.25 |
| dBm/38.16 MHz | 3 | -58.50 | -56.16 | -Infinity | | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured test requirement is expressed as:

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

TPSS/SSS\_sync\_intra = max[600ms, ceil(5 x Kp) x SMTC period] x CSSFintra = 600ms

TSSB\_measurement\_period\_intra = max[200ms, ceil(5 x Kp) x SMTC period] x CSSFintra = 200 ms

Which:

Kp = 1;

SMTC period as defined in Table 4.6.1.1.4.1-3;

CSSFintra = 1

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX

4.6.1.2.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap in DRX within the intra-frequency cell search requirements.

4.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.2.

4.6.1.2.4 Test description

4.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.2.4.1-1.

Table 4.6.1.2.4.1-1: supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.6.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.2.4.1-2 and Table 4.6.1.2.4.1-3.

Table 4.6.1.2.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting  
without gap for PSCell in FR1 with DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

Table 4.6.1.2.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting  
without gap for PSCell in FR1 with DRX

| Parameter | Unit | Test configuration | Value | | Comment |
| --- | --- | --- | --- | --- | --- |
| Test 1 | Test 2 |
| Active cell |  | 1, 2, 3 | E-UTRAN Cell 1 and NR Cell 2 | |  |
| Neighbour cell |  | 1, 2, 3 | NR Cell 3 | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 and Cell 3 | |  |
| SSB configuration |  | 1 | SSB.1 FR1 | |  |
| 2 | SSB.1 FR1 | |  |
| 3 | SSB.2 FR1 | |  |
| SMTC configuration |  | 1 | SMTC.2 | |  |
| 2 | SMTC.1 | |  |
| 3 | SMTC.1 | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |  |
| CP length |  | 1, 2, 3 | Normal | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3 | DRX.1 | DRX.7 | Annex A.5 Table A.5-1 |
| Time offset between PCell and PSCell |  | 1, 2, 3 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| 2 | 3 μs | | Synchronous cells |
| 3 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |  |
| T2 | s | 1, 2, 3 | 5 | 10 |  |

1. Message contents are defined in clause 4.6.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.2.4.2 Test procedure

Same test procedure as in subclause 4.6.1.1.4.2 with Step 8 is replaced by following:

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

4.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.2.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in DRX test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7  Table H.3.7-1 with Condition DRX.1 for Test 1  Table H.3.7-1 with Condition DRX.7 for Test 2  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-1 and 4.6.1.2-4 | Table H.3.1-3 with Condition SSB.1 FR1Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-2 and 4.6.1.2-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-3 and 4.6.1.2-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

4.6.1.2.5 Test requirement

Table 4.6.1.2.4.1-2 and Table 4.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.2.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | | |
| T1 | T2 | T1 | | T2 |
| TDD configuration |  | 1 | N/A | | N/A | | |
| 2 | TDDConf.1.1 | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | | |
| 2 | SR.1.1 TDD | |
| 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | CR.1.1 FDD | | |
| 2 | CR.1.1 TDD | | CR.1.1 TDD | | |
| 3 | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | | |
| 2 | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| 3 | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | | N/A | |
| 2 | TRS.1.1 TDD | | | N/A | |
| 3 | TRS.1.2 TDD | | | N/A | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP. 0.1  ULBWP.0.1 | | DLBWP. 0.1  ULBWP.0.1 | | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | | |
| note 2 | dBm/SCS | 1 | -98 | | | | |
| 2 | -98 | | | | |
| 3 | -95 | | | | |
| note 2 | dBm/15 KHz | 1 | -98 | | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | -1.46 | -Infinity | | -1.46 |
| 2 |
| 3 |
|  | dB | 1 | 4 | 4 | -Infinity | | 4 |
| 2 |
| 3 |
| SS-RSRP note 3 | dBm/SCS KHz | 1 | -94 | -94 | -Infinity | | -94 |
| 2 | -94 | -94 | -Infinity | | -94 |
| 3 | -91 | -91 | -Infinity | | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -Infinity | | -62.25 |
| dBm/9.36 MHz | 2 | -64.60 | -62.25 | -Infinity | | -62.25 |
| dBm/38.16 MHz | 3 | -58.50 | -56.16 | -Infinity | | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 922 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The overall delays measured test requirement is expressed in test 1 with DRX 40ms as:

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

TPSS/SSS\_sync\_intra = max[600ms, ceil(1.5 x 5 x Kp) x max(SMTC period, DRX cycle)] x CSSFintra = 600ms

TSSB\_measurement\_period\_intra = max[200ms, ceil(1.5 x 5 x Kp) x max(SMTC period, DRX cycle)] x CSSFintra = 320 ms

Which:

Kp = 1;

SMTC period as defined in Table 4.6.1.2.4.1-3;

DRX cycle = 40;

CSSFintra = 1

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 922 ms in test 1 (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6402 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The overall delays measured test requirement is expressed in test 2 with DRX 640ms as:

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

TPSS/SSS\_sync\_intra = ceil(5 x Kp) x DRX cycle x CSSFintra= 3200ms

TSSB\_measurement\_period\_intra = ceil( 5 x Kp ) x DRX cycle x CSSFintra = 3200 ms

Which:

Kp = 1;

DRX cycle = 640;

CSSFintra = 1

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6402 ms in test 2 (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX

4.6.1.3.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the TDD intra-frequency cell search requirements.

4.6.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM and BWP operation without bandwidth restriction.

4.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.3.

4.6.1.3.4 Test description

4.6.1.3.4.1 Initial conditions

Test 4.6.1.3 can be run in one of the configurations defined in Table 4.6.1.3.4.1-1.

Table 4.6.1.3.4.1-1: Supported test configurations for NR FR1 Cell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.1.3-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.3-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.3-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.6.1.3-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.3-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.3-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

Table 4.6.1.3.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.6.1.3.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.3.4.1-3.

3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.3.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting  
with per-UE gaps for PSCell in FR1

| Parameter | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- |
| Active cell |  | 1-6 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1-6 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1-6 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| Measurement gap type |  | 1-6 | Per-UE gaps |  |
| Measurement gap repetition periodicity | ms | 1-6 | 40 |  |
| Measurement gap length | ms | 1-6 | 6 |  |
| Measurement gap offset | ms | 1-6 | 39 |  |
| SSB configuration |  | 1,4 | SSB.1 FR1 |  |
| 2,5 | SSB.1 FR1 |  |
| 3,6 | SSB.2 FR1 |  |
| SMTC configuration |  | 1,4 | SMTC.2 |  |
| 2,5 | SMTC.1 |  |
| 3,6 | SMTC.1 |  |
| CSI-RS parameters |  | 1,4 | CSI-RS.1.2 FDD resource #0 |  |
| 2,5 | CSI-RS.1.2 TDD resource #0 |  |
| 3,6 | CSI-RS.2.2 TDD resource #0 |  |
| A3-Offset | dB | 1-6 | -4.5 |  |
| CP length |  | 1-6 | Normal |  |
| Hysteresis | dB | 1-6 | 0 |  |
| Time To Trigger | s | 1-6 | 0 |  |
| Filter coefficient |  | 1-6 | 0 | L3 filtering is not used |
| DRX |  | 1-6 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1-6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1,4 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| 2,5 | 3 μs | Synchronous cells |
| 3,6 | 3 μs | Synchronous cells |
| T1 | s | 1-6 | 5 |  |
| T2 | s | 1-6 | 5 |  |

4.6.1.3.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.3.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.3.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 4.6.1.3.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting with gap in non-DRX test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition Pattern #0  Table H.3.5-8 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-1 and 4.6.1.3-4 | Table H.3.1-3 with Condition SSB.1 FR1 andTable 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-2 and 4.6.1.3-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-3 and 4.6.1.3-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.6.1.3.4.3-2: *ServingCellConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } |  |  |  |
| } |  |  |  |

Table 4.6.1.3.4.3-3

|  |  |
| --- | --- |
| Condition | Explanation |
| BWP-Id1 | Active BWP (BWP2) |

4.6.1.3.5 Test requirement

Tables 4.6.1.3.4.1-3 and 4.6.1.3.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

Table 4.6.1.3.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1,4 | N/A | | N/A | |
| 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | | N/A | |
| 2,5 | SR.1.1 TDD | |
| 3,6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | | CR.1.1 FDD | |
| 2,5 | CR.1.1 TDD | | CR.1.1 TDD | |
| 3,6 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| 2,5 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns |  | 1-6 | OP.1 | | OP.1 | |
| TRS configuration |  | 1,4 | TRS.1.1 FDD | | N/A | |
| 2,5 | TRS.1.1 TDD | | N/A | |
| 3,6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration |  | 1-6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1-6 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1-6 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1-6 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1,4 | -98 | | | |
| 2,5 | -98 | | | |
| 3,6 | -95 | | | |
| Note 2 | dBm/15 kHz | 1,4 | -98 | | | |
| 2,5 |
| 3,6 |
|  | dB | 1,4 | 4 | -1.46 | -Infinity | -1.46 |
| 2,5 |
| 3,6 |
|  | dB | 1,4 | 4 | 4 | -Infinity | 4 |
| 2,5 |
| 3,6 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1,4 | -94 | -94 | -Infinity | -94 |
| 2,5 | -94 | -94 | -Infinity | -94 |
| 3,6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1,4 | -64.60 | -62.25 | -64.60 | -62.25 |
| dBm/9.36 MHz | 2,5 | -64.60 | -62.25 | -64.60 | -62.25 |
| dBm/38.16 MHz | 3,6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition |  | 1-6 | AWGN | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_with\_index

where,

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

TPSS/SSS\_sync\_ntra = max (600ms, ceil (5 x Kp) x SMTC period)Note 1 x CSSFintra = max (600ms, ceil (5 x 1) x 20ms) x 1 = 600ms

T SSB\_measurement\_period\_intra = max (200ms, ceil (5 x Kp) x SMTC period)Note 1 x CSSFintra = max (200ms, ceil (5 x 1) x 20ms) x 1 = 200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

#### 4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX

4.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the intra-frequency cell search requirements.

4.6.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

4.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.4.

4.6.1.4.4 Test description

4.6.1.4.4.1 Initial conditions

Test 4.6.1.4 can be run in one of the configurations defined in Table 4.6.1.4.4.1-1.

Table 4.6.1.4.4.1-1: Supported test configurations for NR FR1 Cell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.1.4-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.4-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.4-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.6.1.4-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.4-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.4-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.4.4.1-2.

Table 4.6.1.4.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.6.1.4.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.4.4.1-3.

3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.4.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting  
with per-UE gaps for PSCell in FR1 with DRX

| Parameter | Unit | Test configuration | Value | | Comment |
| --- | --- | --- | --- | --- | --- |
| Test 1 | Test 2 |
| Active cell |  | 1-6 | E-UTRAN Cell 1 and NR Cell 2 | |  |
| Neighbour cell |  | 1-6 | NR Cell 3 | | Cell to be identified. |
| RF Channel Number |  | 1-6 | 1: Cell 1  2: Cell 2 and Cell 3 | |  |
| Measurement gap type |  | 1-6 | Per-UE gaps | |  |
| Measurement gap repetition periodicity | ms | 1-6 | 40 | |  |
| Measurement gap length | ms | 1-6 | 6 | |  |
| Measurement gap offset | ms | 1-6 | 39 | |  |
| SSB configuration |  | 1,4 | SSB.1 FR1 | |  |
| 2,5 | SSB.1 FR1 | |  |
| 3,6 | SSB.2 FR1 | |  |
| SMTC configuration |  | 1,4 | SMTC.2 | |  |
| 2,5 | SMTC.1 | |  |
| 3,6 | SMTC.1 | |  |
| CSI-RS parameters |  | 1,4 | CSI-RS.1.2 FDD resource #0 | |  |
| 2,5 | CSI-RS.1.2 TDD resource #0 | |  |
| 3,6 | CSI-RS.2.2 TDD resource #0 | |  |
| A3-Offset | dB | 1-6 | -4.5 | |  |
| CP length |  | 1-6 | Normal | |  |
| Hysteresis | dB | 1-6 | 0 | |  |
| Time To Trigger | s | 1-6 | 0 | |  |
| Filter coefficient |  | 1-6 | 0 | | L3 filtering is not used |
| DRX |  | 1-6 | DRX.1 | DRX.7 |  |
| Time offset between PCell and PSCell |  | 1-6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1,4 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| 2,5 | 3 μs | | Synchronous cells |
| 3,6 | 3 μs | | Synchronous cells |
| T1 | s | 1-6 | 5 | |  |
| T2 | s | 1-6 | 5 | 10 |  |

4.6.1.4.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.4.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.4.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.1.4.4.1-3 as appropriate.

4.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.4.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2  Table H.3.7-1 with Condition DRX.1 and Gap for test 1  Table H.3.7-1 with Condition DRX.7 and Gap for test 2  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition Pattern #0  Table H.3.5-8 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-1 and 4.6.1.3-4 | Table H.3.1-3 with Condition SSB.1 FR1 andTable 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-2 and 4.6.1.3-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-3 and 4.6.1.3-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.6.1.4.4.3-2: *ServingCellConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } |  |  |  |
| } |  |  |  |

Table 4.6.1.4.4.3-3

|  |  |
| --- | --- |
| Condition | Explanation |
| BWP-Id1 | Active BWP (BWP2) |

4.6.1.4.5 Test requirement

Tables 4.6.1.4.4.1-3 and 4.6.1.4.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

Table 4.6.1.4.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1,4 | N/A | | N/A | |
| 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | | N/A | |
| 2,5 | SR.1.1 TDD | |
| 3,6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | | CR.1.1 FDD | |
| 2,5 | CR.1.1 TDD | | CR.1.1 TDD | |
| 3,6 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| 2,5 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns |  | 1-6 | OP.1 | | OP.1 | |
| TRS configuration |  | 1,4 | TRS.1.1 FDD | | N/A | |
| 2,5 | TRS.1.1 TDD | | N/A | |
| 3,6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration |  | 1-6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1-6 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1-6 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1-6 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1,4 | -98 | | | |
| 2,5 | -98 | | | |
| 3,6 | -95 | | | |
| Note 2 | dBm/15 KHz | 1,4 | -98 | | | |
| 2,5 |
| 3,6 |
|  | dB | 1,4 | 4 | -1.46 | -Infinity | -1.46 |
| 2,5 |
| 3,6 |
|  | dB | 1,4 | 4 | 4 | -Infinity | 4 |
| 2,5 |
| 3,6 |
| SS-RSRP Note 3 | dBm/SCS KHz | 1,4 | -94 | -94 | -Infinity | -94 |
| 2,5 | -94 | -94 | -Infinity | -94 |
| 3,6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1,4 | -64.60 | -62.25 | -64.60 | -62.25 |
| dBm/9.36 MHz | 2,5 | -64.60 | -62.25 | -64.60 | -62.25 |
| dBm/38.16 MHz | 3,6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition |  | 1-6 | AWGN | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_with\_index

where,

For Test 1:

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra) ms

TPSS/SSS\_sync\_ntra = max (600ms, ceil(1.5x 5 x Kp) x max (SMTC period,DRX cycle)) x CSSFintra = max (600ms, ceil(1.5 x 5 x 1) x max (20ms, 40ms)) x 1 = 600ms

T SSB\_measurement\_period\_intra = max (200ms, ceil(1.5x 5 x Kp) x max (SMTC period,DRX cycle)) x CSSFintra = max (200ms, ceil(1.5 x 5 x 1) x max (20ms, 40ms)) x1 = 320ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For Test 2:

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra) ms

TPSS/SSS\_sync\_ntra = ceil (5 x Kp) x DRX cycle x CSSFintra = ceil (5 x1) x 640ms x 1 = 3200ms

T SSB\_measurement\_period\_intra = ceil (5 x Kp ) x DRX cycle x CSSFintra = ceil (5 x1) x 640ms x 1 = 3200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 6402 ms in this test case (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

#### 4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection

4.6.1.5.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

4.6.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

4.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.5.

4.6.1.5.4 Test description

4.6.1.5.4.1 Initial conditions

Test 4.6.1.5 can be run in one of the configurations defined in Table 4.6.1.5.4.1-1.

Table 4.6.1.5.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.1.5-1 | LTE FDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.5-2 | LTE TDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

Table 4.6.1.5.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.6.1.5.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.5.4.1-3.

3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.5.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

| Parameter | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- |
| Active cell |  | 1,2 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1,2 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1,2 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| SSB configuration |  | 1,2 | SSB.1 FR1 |  |
| SMTC configuration |  | 1,2 | SMTC.2 |  |
| A3-Offset | dB | 1,2 | -4.5 |  |
| CP length |  | 1,2 | Normal |  |
| Hysteresis | dB | 1,2 | 0 |  |
| Time To Trigger | s | 1,2 | 0 |  |
| Filter coefficient |  | 1,2 | 0 | L3 filtering is not used |
| DRX |  | 1,2 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1,2 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1 | s | 1,2 | 5 |  |
| T2 | s | 1,2 | 5 |  |

4.6.1.5.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.5.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.5.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.5.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition SSB.1 FR1 and  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2Table H.3.1-4 with Condition SSB Index and A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ and SSB Index  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |

4.6.1.5.5 Test requirement

Tables 4.6.1.5.4.1-3 and 4.6.1.5.5-1 define the primary level settings including test tolerances for EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection.

Table 4.6.1.5.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1,2 | N/A | | N/A | |
| PDSCH RMC configuration |  | 1,2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1,2 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration |  | 1,2 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Patterns |  | 1,2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1,2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1,2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1,2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1,2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1,2 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1,2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1,2 | -98 | | | |
|  | dB | 1,2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1,2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1,2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1,2 | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition |  | 1,2 | AWGN | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_with\_index

where,

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra) ms

- TPSS/SSS\_sync\_intra = max (600ms, ceil (5 x Kp) x SMTC period)Note 1 x CSSFintra = max (600ms, Ceil(5 x 1) x 20ms) x 1 = 600ms

- T SSB\_measurement\_period\_intra = max (200ms, ceil ( 5 x Kp) x SMTC period )Note 1 x CSSFintra = max (200ms, ceil( 5 x 1) x 20ms) x 1 = 200ms

- TSSB\_time\_index\_intra = max (120ms, ceil (3 x Kp)x SMTC period)Note 1 x CSSFintra = max (120ms, ceil ( 3 x 1)x 20ms) x 1 = 120ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

#### 4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection

4.6.1.6.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

4.6.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM and BWP operation without bandwidth restriction.

4.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.6.

4.6.1.6.4 Test description

4.6.1.6.4.1 Initial conditions

Test 4.6.1.6 can be run in one of the configurations defined in Table 4.6.1.6.4.1-1.

Table 4.6.1.6.4.1-1: Supported test configurations for NR FR1 Cell

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.1.6-1 | LTE FDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.6-2 | LTE TDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.6.4.1-2.

Table 4.6.1.6.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.6.1.6.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.6.4.1-3.

3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.6.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting  
with gap for PSCell in FR1 with SSB index reading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1,2 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1,2 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1,2 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| Measurement gap type |  | 1,2 | Per-UE gaps |  |
| Measurement gap repetition periodicity | ms | 1,2 | 40 |  |
| Measurement gap length | ms | 1,2 | 6 |  |
| Measurement gap offset | ms | 1,2 | 39 |  |
| SSB configuration |  | 1,2 | SSB.1 FR1 |  |
| SMTC configuration |  | 1,2 | SMTC.2 |  |
| CSI-RS parameters |  | 1,2 | CSI-RS.1.2 FDD resource #0 |  |
| A3-Offset | dB | 1,2 | -4.5 |  |
| CP length |  | 1,2 | Normal |  |
| Hysteresis | dB | 1,2 | 0 |  |
| Time To Trigger | s | 1,2 | 0 |  |
| Filter coefficient |  | 1,2 | 0 | L3 filtering is not used |
| DRX |  | 1,2 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1,2 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1 | s | 1,2 | 5 |  |
| T2 | s | 1,2 | 5 |  |

4.6.1.6.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.6.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.6.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.6.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 4.6.1.6-1  Table H.3.1-4 with Condition SSB Index and A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ and SSB Index  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition Pattern #0  Table H.3.5-8 |

Table 4.6.1.6.4.3-2: *ServingCellConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } |  |  |  |
| } |  |  |  |

|  |  |
| --- | --- |
| Condition | Explanation |
| BWP-Id1 | Active BWP (BWP2) |

4.6.1.6.5 Test requirement

Tables 4.6.1.6.4.1-3 and 4.6.1.6.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading.

Table 4.6.1.6.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1,2 | N/A | | N/A | |
| PDSCH RMC configuration |  | 1,2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1,2 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration |  | 1,2 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| OCNG Patterns |  | 1,2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1,2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1,2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1,2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1,2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1,2 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1,2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1,2 | -98 | | | |
|  | dB | 1,2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1,2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1,2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1,2 | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition |  | 1,2 | AWGN | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_with\_index

where,

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra) ms

TPSS/SSS\_sync\_ntra = max (600ms, ceil (5 x Kp) x SMTC period)Note 1 x CSSFintra = max (600ms, Ceil(5 x 1) x 20ms) x 1 = 600ms

T SSB\_measurement\_period\_intra = max (200ms, ceil ( 5 x Kp) x SMTC period )Note 1 x CSSFintra =max (200ms, ceil( 5 x 1) x 20ms) x 1 = 200ms

TSSB\_time\_index\_intra = max (120ms, ceil (3 x Kp)x SMTC period)Note 1 x CSSFintra = max (120ms, ceil ( 3 x 1)x 20ms) x 1 = 120ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

#### 4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

4.6.1.7.1 Test purpose

This test is to verify that the UE makes correct reporting of an event for UE configured with *highSpeedMeasFlag-r16*. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

4.6.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.7.

4.6.1.7.4 Test description

4.6.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.7.4.1-1.

Table 4.6.1.7.4.1-1: supported test configurations for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.1.7-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.1.7-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.1.7-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.6.1.7-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.1.7-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.1.7-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.7.4.1-2 and Table 4.6.1.7.4.1-3.

Table 4.6.1.7.4.1-2: Initial conditions for EN-DC FR1 event-triggered reporting without gap in DRX  
for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

Table 4.6.1.7.4.1-3: General test parameters for EN-DC FR1 event-triggered reporting  
without gap in DRX for UE configured with highSpeedMeasFlag-r16

| Parameter | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- |
| *highSpeedMeasFlag-r16* |  | 1,2,3,4,5,6 | Present | To enable high speed measurement enhancements |
| Active cell |  | 1, 2, 3,4,5,6 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1, 2, 3,4,5,6 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3,4,5,6 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| SSB configuration |  | 1,4 | SSB.1 FR1 |  |
| 2,5 | SSB.1 FR1 |  |
| 3,6 | SSB.2 FR1 |  |
| SMTC configuration |  | 1,4 | SMTC.2 |  |
| 2,5 | SMTC.1 |  |
| 3,6 | SMTC.1 |  |
| A3-Offset | dB | 1, 2, 3,4,5,6 | -4.5 |  |
| CP length |  | 1, 2, 3,4,5,6 | Normal |  |
| Hysteresis | dB | 1, 2, 3,4,5,6 | 0 |  |
| Time To Trigger | s | 1, 2, 3,4,5,6 | 0 |  |
| Filter coefficient |  | 1, 2, 3,4,5,6 | 0 | L3 filtering is not used |
| DRX |  | 1, 2, 3,4,5,6 | DRX.7. | 640ms DRX cycle |
| Time offset between PCell and PSCell |  | 1, 2, 3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1,4 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| 2,5 | 3 μs | Synchronous cells |
| 3,6 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3,4,5,6 | 5 |  |
| T2 | s | 1, 2, 3,4,5,6 | 6 |  |

1. Message contents are defined in clause 4.6.1.7.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.7.4.2 Test procedure

Same test procedure as in subclause 4.6.1.1.4.2 with Step 1 and 8 are replaced by following:

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE is configured with *highSpeedMeasFlag-r16.*

8. UE shall transmit a *MeasurementReport* message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than 5122 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

4.6.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.7.4.3-0: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7  Table H.3.7-1 with Condition DRX.7  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-1 and 4.6.1.2-4 | Table H.3.1-3 with Condition SSB.1 FR1 and  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-2 and 4.6.1.2-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-3 and 4.6.1.2-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.6.1.7.4.3-1: Void

Table 4.6.1.7.4.3-2: Void

Table 4.6.1.7.4.3-3: CellGroupConfig (Step 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition EN-DC | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex for Cell 2 |  |  |
| reconfigurationWithSync SEQUENCE { |  |  |  |
| spCellConfigCommon | ServingCellConfigCommon | Table 4.6.1.7.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.1.7.4.3-4: ServingCellConfigCommon (Table 4.6.1.7.4.3-3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition HST | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { |  |  |  |
| highSpeedConfig-r16 SEQUENCE { |  |  |  |
| highSpeedMeasFlag-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |

4.6.1.7.5 Test requirement

Table 4.6.1.7.4.1-2 and Table 4.6.1.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.7.5-1: NR Cell specific test parameters for EN-DC FR1 event-triggered reporting  
without gap in DRX for UE configured with highSpeedMeasFlag-r16

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | T1 | T2 | T1 | | T2 |
| TDD configuration |  | 1,4 | N/A | | N/A | | |
|  |  | 2,5 | TDDConf.1.1 | | TDDConf.1.1 | | |
|  |  | 3,6 | TDDConf.2.1 | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | | N/A | | |
|  |  | 2,5 | SR.1.1 TDD | |
|  |  | 3,6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | | CR.1.1 FDD | | |
| 2,5 | CR.1.1 TDD | | CR.1.1 TDD | | |
| 3,6 | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.1 FDD | | CCR.1.1 FDD | | |
|  |  | 2,5 | CCR.1.1 TDD | | CCR.1.1 TDD | | |
|  |  | 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| OCNG Patterns |  | 1, 2, 3,4,5,6 | OP.1 | | OP.1 | | |
| TRS configuration |  | 1,4 | TRS.1.1 FDD | | N/A | | |
|  |  | 2,5 | TRS.1.1 TDD | | N/A | | |
|  |  | 3,6 | TRS.1.2 TDD | | N/A | | |
| Initial BWP configuration |  | 1, 2, 3,4,5,6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | | |
| Active DL BWP configuration |  | 1, 2, 3,4,5,6 | DLBWP.1.1 | | DLBWP.1.1 | | |
| Active UL BWP configuration |  | 1, 2, 3,4,5,6 | ULBWP.1.1 | | ULBWP.1.1 | | |
| RLM-RS |  | 1, 2, 3,4,5,6 | SSB | | SSB | | |
| Note 2 | dBm/SCS | 1,4 | -98 | | | | |
|  |  | 2,5 | -98 | | | | |
|  |  | 3,6 | -95 | | | | |
| Note 2 | dBm/15 kHz | 1,4 | -98 | | | | |
|  |  | 2,5 |  | | | | |
|  |  | 3,6 |  | | | | |
|  | dB | 1,4 | 4 | -1.46 | -Infinity | | -1.46 |
|  |  | 2,5 |  |  |  | |  |
|  |  | 3,6 |  |  |  | |  |
|  | dB | 1,4 | 4 | 4 | -Infinity | | 4 |
|  |  | 2,5 |  |  |  | |  |
|  |  | 3,6 |  |  |  | |  |
| SS-RSRP Note 3 | dBm/SCS kHz | 1,4 | -94 | -94 | -Infinity | | -94 |
|  |  | 2,5 | -94 | -94 | -Infinity | | -94 |
|  |  | 3,6 | -91 | -91 | -Infinity | | -91 |
| Io | dBm/9.36 MHz | 1,4 | -64.60 | -62.25 | -64.60 | | -62.25 |
|  | dBm/9.36 MHz | 2,5 | -64.60 | -62.25 | -64.60 | | -62.25 |
|  | dBm/38.16 MHz | 3,6 | -58.50 | -56.16 | -58.50 | | -56.16 |
| Propagation Condition |  | 1, 2,4,5 | AWGN | | | AWGN 1944 Hz Note 4 | |
|  |  | 3,6 | AWGN | | | AWGN 3334 Hz Note 5 | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944Hz.  NOTE 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334Hz. | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than Tidentify\_intra\_without\_index + 2 TTIDCCH ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra, is the measurement reporting delay.

TPSS/SSS\_sync\_intra = ceil(5 Kp) DRX cycle CSSFintra = 3200 ms, is the time period used in PSS/SSS detection defined in 38.133 [6] clause 9.2.5.1

TSSB\_measurement\_period\_intra = ceil(Y Kp ) DRX cycle CSSFintra = 1920 ms, equal to a measurement period of SSB based measurement defined in 38.133 [6] clause 9.2.5.2.

Where:

Kp = 1 for intra-frequency SMTC which is fully non-overlapping with measurement gaps;

DRX cycle = 640 as given in Table 4.6.1.7.4.1-3;

CSSFintra = 1 when only 1 intra-frequency layer is configured.

Y = 3 for DRX cycle =640 ms and SMTC period = 20 ms as given in Table 4.6.1.7.4.1-3.

TTIDCCH = 1 ms, is the TTI insertion uncertainty.

That gives a total of 5122 ms.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

#### 4.6.1.8 EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

4.6.1.8.1 Test purpose

This test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasCA-Scell-r17. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.

4.6.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced NR CA measurement requirements in high-speed scenario.

4.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.8.

4.6.1.8.4 Test description

4.6.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.8.4.1-1.

Table 4.6.1.8.4.1-1: Supported test configurations for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.1.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.1.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: NR cell3 has the same SCS, BW and duplex mode as NR cell2 | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.8.4.1-2.

Table 4.6.1.8.4.1-2: Initial conditions for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.6.1.8.4.1-3.

2. Message contents are defined in clause 4.6.1.8.4.3.

3. There are four cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as deactivated SCell in FR1 on NR RF channel 2 and NR cell 4 as neighbour cell on NR RF channel 2.

Table 4.6.1.8.4.1-3: General test parameters for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Value | | Comment |
|  |  | configuration | Test 1 | Test 2 |  |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Deactivated Scell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 4 | | NR cell 4 is on NR RF channel number 2. |
| A6-Offset | dB | Config 1,2,3,4,5,6 | -4.5 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| Measurement gap pattern Id |  |  | OFF | |  |
| SCell measurement cycle (measCycleSCell) |  | Config 1,2,3,4,5,6 | 160 ms | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | As specified in clause A.3.3 |
| DRX |  | Config 1,2,3,4,5,6 | DRX.4 | |  |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between PSCell and deactivated SCell |  | Config 1,4 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | Config 2,3,5,6 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1 | |  |

4.6.1.8.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3 and cell 4.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (LTE Cell 1), PSCell (NR Cell 2) and the deactivated SCell (NR Cell 3) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.8.4.3.

4. Set the parameters according to T1 in Table 4.6.1.1**.**4.1**-**2. Propagation conditions are set according to Annex C clauses C.2.2

5. The SS shall transmit an RRCConnectionReconfiguration message with event A6 configured for NR cell 4.

6. The UE shall transmit an RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.8**.**4.1**-**2.

8. UE shall transmit a MeasurementReport message triggered by Event A6 for NR Cell 4 on PCell (LTE Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than 1600 the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement, then the number of failure tests is increased by one.

9. The SS waits until the MeasurementReport message is received or when T2 expires.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 1) mod 14 + 2)] for next iteration of the test procedure loop.

12. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

14. Repeat steps 3-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.8.4.3-1: Common Exception messages for Additional EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-5  Table H.3.1-7  Table H.3.7-2 with Condition DRX.4  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.6.1.8-1 and 4.6.1.8-4 | Table H.3.1-3 with Condition SSB.1 FR1 and  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.8-2 and 4.6.1.8-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.8-3 and 4.6.1.8-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.6.1.8.4.3-2: ReportConfigNR-DEFAULT(a6-offset): NR report configuration for event A6

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT\_A6 | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| eventTriggered SEQUENCE { |  |  |  |
| eventId CHOICE { |  |  |  |
| eventA6 SEQUENCE { |  |  |  |
| a6-Offset CHOICE { |  |  |  |
| rsrp | -9 | The actual value is field value \* 0.5 dB. |  |
| } |  |  |  |
| hysteresis | 0 |  |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.1.8.4.3-3: ServingCellConfigCommon

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { |  |  |  |
| HighSpeedConfig-v1700 SEQUENCE { |  |  |  |
| highSpeedMeasCA-Scell-r17 | true |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.1.8.4.3-4: MeasObjectNR-DEFAULT: measCycleSCell configuration for SCell intra-frequency measurements

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| measCycleSCell-v1530 | sf160 |  |  |
| } |  |  |  |

4.6.1.8.5 Test requirement

Table 4.6.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 event triggered reporting.

Table 4.6.1.8.5-1: NR cell specific test parameters for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Cell 2 | | | Cell 3 | | Cell 4 | |
|  |  | configuration | T1 | T2 | | T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | 2 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | | | FDD | |
|  |  | Config 2,3,5,6 | TDD | | | | | TDD | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | | | 10: NRB,c = 52 | |
|  |  | Config 2,5 | 10: NRB,c = 52 | | | | | 10: NRB,c = 52 | |
|  |  | Config 3,6 | 40: NRB,c = 106 | | | | | 40: NRB,c = 106 | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | | | 10: NRB,c = 52 | |
|  |  | Config 2,5 | 10: NRB,c = 52 | | | | | 10: NRB,c = 52 | |
|  |  | Config 3,6 | 40: NRB,c = 106 | | | | | 40: NRB,c = 106 | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | Config 3,6 | TDDConf.2.1 | | | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | | NA | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | | DLBWP.1.1 | | DLBWP.1.1 | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | | NA | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | | NA | | NA | |
|  |  | Config 2,5 | TRS.1.1 TDD | | | NA | | NA | |
|  |  | Config 3,6 | TRS.1.2 TDD | | | NA | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | | OP.1 | | OP.1 | |
| PDSCH Reference |  | Config 1,4 | SR.1.1 FDD | | | SR.1.1 FDD | | SR.1.1 FDD | |
| measurement channel |  | Config 2,5 | SR.1.1 TDD | | | SR.1.1 TDD | | SR.1.1 TDD | |
|  |  | Config 3,6 | SR2.1 TDD | | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference |  | Config 1,4 | CR.1.1 FDD | | | CR.1.1 FDD | | CR.1.1 FDD | |
| Channel |  | Config 2,5 | CR.1.1 TDD | | | CR.1.1 TDD | | CR.1.1 TDD | |
|  |  | Config 3,6 | CR2.1 TDD | | | CR2.1 TDD | | CR2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | CCR.1.1 FDD | |
|  | Config 2,5 | CCR.1.1 TDD | | | CCR.1.1 TDD | | CCR.1.1 TDD | |
|  | Config 3,6 | CCR.2.1 TDD | | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | | SSB.5 FR1 | | SSB.5 FR1 | |
|  |  | Config 2,5 | SSB.1 FR1 | | | SSB.5 FR1 | | SSB.5 FR1 | |
|  |  | Config 3,6 | SSB.2 FR1 | | | SSB.6 FR1 | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | | SMTC.5 | | SMTC.5 | |
| defined in A.3.11 |  | Config 2,3,5,6 | SMTC.1 | | | SMTC.4 | | SMTC.4 | |
| PDSCH/PDCCH | kHz | Config 1,2,4,5 | 15 | | | | | | |
| subcarrier spacing |  | Config 3,6 | 30 | | | | | | |
| EPRE ratio of PSS to SSS |  |  |  | | |  | |  | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  | | |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  | | |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  | | |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS |  | Config 1,2,3,4,5,6 | 0 | | | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | | |  | |  | |
| EPRE ratio of PDSCH to PDSCH |  |  |  | | |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | | |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | | |  | |  | |
| Note2 | dBm/15kHz |  | -98 | | | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | | -98 | | -98 | |
|  | Config 3,6 | -95 | | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | | -94 | -94 | -94 | -Infinity | -94 |
|  | Config 3,6 | -91 | | -91 | -91 | -91 | -Infinity | -91 |
|  | dB | Config 1,2,3,4,5,6 | 4 | | 4 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | Config 1,2,3,4,5,6 | 4 | | 4 | 4 | 4 | -Infinity | 4 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | | -64.59 | -64.59 | -62.26 | -64.59 | -62.26 |
|  | dBm/38.16MHz | Config 3,6 | -58.49 | | -58.49 | -58.49 | -56.15 | -58.49 | -56.15 |
| Propagation Condition |  | Config 1,2,4,5 | AWGN | | | AWGN | | AWGN 1944Hz Note 5 | |
|  | Config 3,6 | AWGN | | | AWGN | | AWGN 3334Hz Note 6 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.  Note 6: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz. | | | | | | | | | |

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 1600 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 4.6.2 Inter-frequency measurements

#### 4.6.2.0 Minimum conformance requirements for Inter-frequency measurements

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,

- SS-RSRQ related side conditions given in clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,

- SS-SINR related side conditions given in clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to clause B.2.3 for a corresponding Band.

[TS 38.133-f50, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2 and table 4.6.2.0-4 when *highSpeedMeasInterFreq-r17* is configured and UE supports measurementEnhancementInterFreq-r17.

TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and Table 9.3.4.4 [Editor's note: '9.3.4.4' has probably to be deleted!] 4.6.2.0-5 when *highSpeedMeasInterFreq* is configured and UE supports measurementEnhancementInterFreq-r17.

TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 9.3.5-1 and Table [Editor's note: this line has probably to be deleted!]

TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 4.6.2.0-6, table 4.6.2.0-7 and table 4.6.2.0-7 when *highSpeedMeasInterFreq* is configured and UE supports [measurementEnhancementInterFreq-r17.

CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in TS 38.133 section 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection, (Frequency range FR1)

[Editor's note: should be named Table 4.6.2.0-1]

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_inter |
| No DRX | Max(600ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\*1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1.  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 4.6.2.0-2 FFS

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

[Editor's note: should be named Table 4.6.2.0-3]

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_inter |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 4.6.2.0-4: Time period for PSS/SSS detection when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_inter |
| No DRX | max(600ms, N1 × Max(MGRP, SMTC period)) × CSSFinter  N1 = 7 |
| DRX cycle ≤ 160ms | max(600ms, ceil(N2) x max(MGRP, SMTC period, DRX cycle)) x CSSFinter  N2 = 7 x M2 |
| 160ms < DRX cycle ≤ 320ms | ceil(N3) x DRX cycle x CSSFinter  N3 = 7 x M2 |
| DRX cycle>320ms | N4 x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1  NOTE 3: N4=6 if SMTC periodicity > 40 ms, otherwise N4=5 | |

Table 4.6.2.0-5: Time period for time index detection when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_inter |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2 NOTE3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.  NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |

[TS 38.133-f50, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 subclauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 4.6.2.0-6. When *highSpeedMeasInterFreq-r17* is configured, and UE supports *measurementEnhancementInterFreq-r17*, T SSB\_measurement\_period\_inter is specified in Table 4.6.2.0-7:

Table 4.6.2.0-6: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | T SSB\_measurement\_period\_inter |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 4.6.2.0-7: Measurement period for inter-frequency measurements with gaps when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | T SSB\_measurement\_period\_inter |
| No DRX | max(200ms, 7 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 160ms | max(200ms, ceil(7 x M2 NOTE3) x max(MGRP, SMTC period, DRX cycle)) x CSSFinter |
| 160ms < DRX cycle ≤ 320ms | ceil(7 x M2 NOTE3) x DRX cycle x CSSFinter |
| DRX cycle>320ms | 4 x M2 NOTE3 x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.  NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 | |

[TS 38.133, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in sections 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 × TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. Both Tidentify\_inter\_without\_index and Tidentify\_inter\_with\_index are defined in clause 9.3.4.When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_inter\_without\_index or Tidentify\_inter\_with\_index defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than T SSB\_measurement\_period\_inter defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

#### 4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX

4.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.1.

4.6.2.1.4 Test description

4.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.1.4.1-2. Test environment parameters are given in Table 4.6.2.1.4.1-3.

Table 4.6.2.1.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in  
non-DRX supported test configurations

|  |  |
| --- | --- |
| **Test Case ID** | **Description** |
| 4.6.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations  NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

Table 4.6.2.1.4.1-2: General test parameters for EN-DC inter-frequency  
event triggered reporting without SSB time index detection in non-DRX

| Parameter | Unit | Test configuration | Value | | Comment |
| --- | --- | --- | --- | --- | --- |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 4 | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | 9 |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1 | 1 |  |

Table 4.6.2.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency  
event triggered reporting without SSB time index detection in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 4.6.2.1.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 4.6.2.1.4.1-2 is provided for UE that support per-FR gap. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.1.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 920 ms for Test 1 and 800 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.1.4.1-2 as appropriate.

4.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.1.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1  
event triggered reporting tests in non-DRX test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3  Table H.3.4-4 with Condition gapUE for Test 1  Table H.3.4-4 with Condition gapFR1 for Test 2  Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1  Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 2 |
| Specific message contents exceptions for Test Configuration 4.6.2.1-1 and 4.6.2.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.1-2 and 4.6.2.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.1-3 and 4.6.2.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

Table 4.6.2.1.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 [25], Table 4.6.3-20 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| sr-ConfigIndex | 23 |  | TDD |
| } |  |  |  |
| } |  |  |  |

4.6.2.1.5 Test requirement

Table 4.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered  
reporting without SSB time index detection in non-DRX

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| OCNG Patterns |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
| Config 2,5 | TRS.1.1 TDD | | NA | |
| Config 3,6 | TRS.1.2 TDD | | NA | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR 2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR 2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  | Config 2,5 | CCR.1.1 TDD | |
|  | Config 3,6 | CCR 2.1 TDD | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
|  |  | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | AWGN | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX

4.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.2.

4.6.2.2.4 Test description

4.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.2.4.1-2. Test environment parameters are given in Table 4.6.2.2.4.1-3.

Table 4.6.2.2.4.1-1: EN-DC FR1-FR1 event triggered reporting tests  
in DRX supported test configurations

|  |  |
| --- | --- |
| **Test Case ID** | **Description** |
| 4.6.2.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

Table 4.6.2.2.4.1-2: General test parameters for EN-DC inter-frequency  
event triggered reporting without SSB time index detection in DRX

| Parameter | Unit | Test configuration | Value | | | | Comment |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | | 4 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | | 9 | |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in A.5 |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 11 | 1.1 | 11 |  |

Table 4.6.2.2.4.1-3: Test Environment parameters for EN-DC inter-frequency  
event triggered reporting without SSB time index detection in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 4.6.2.2.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 4.6.2.2.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.2.4.1-2 and Table 4.6.2.2.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.2.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1, 10240 ms for Test 2, 1080 ms for Test 3 and 10240 ms for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.2.4.1-2 as appropriate.

4.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.2.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1  
event triggered reporting with SSB test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3  Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3  Table H.3.4-4 with Condition gapUE for Test 1 and Test 2  Table H.3.4-4 with Condition gapFR1 for Test 3 and Test 4  Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 and Test 2  Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 3 and Test 4 |
| Specific message contents exceptions for Test Configuration 4.6.2.2-1 and 4.6.2.2-4 | Table H.3.1-3 with Conditions INTER-FREQ MO  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.2-2 and 4.6.2.2-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.2-3 and 4.6.2.2-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

Table 4.6.2.2.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 [25], Table 4.6.3-20 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| sr-ConfigIndex | 23 |  | TDD |
| } |  |  |  |
| } |  |  |  |

4.6.2.2.5 Test requirement

Table 4.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.2.5-1: Cell specific test parameters for EN-DC inter-frequency  
event triggered reporting without SSB time index detection

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
|  |  | Config 2,5 | TRS.1.1 TDD | | NA | |
|  |  | Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR 2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR 2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  | Config 2,5 | CCR.1.1 TDD | |
|  | Config 3,6 | CCR 2.1 TDD | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | AWGN | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.2.3 Void

#### 4.6.2.4 Void

#### 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

4.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.3.

4.6.2.5.4 Test description

4.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.5.4.1-2. Test environment parameters are given in Table 4.6.2.5.4.1-3.

Table 4.6.2.5.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in  
non-DRX with SSB time index detection supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.6.2.5 -1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.5 -2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.5 -3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.5 -4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.5 -5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.5 -6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

Table 4.6.2.5.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting  
with SSB time index detection in non-DRX

| Parameter | Unit | Test configuration | Value | | Comment |
| --- | --- | --- | --- | --- | --- |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 4 | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | 9 |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 1 |  |

Table 4.6.2.5.4.1-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.2.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.5.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 4.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 4.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.5.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.5.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1040 ms for Test 1 and 920 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.)

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.5.4.1-2 as appropriate.

4.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.5.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1  
event triggered reporting tests in non-DRX with SSB test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ  Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ and SSB Index  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3  Table H.3.4-4 with Condition gapUE for Test 1  Table H.3.4-4 with Condition gapFR1 for Test 2  Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1  Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 2 |
| Specific message contents exceptions for Test Configuration 4.6.2.5-1 and 4.6.2.5-4 | Table H.3.1-3 with Conditions INTER-FREQ MO  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.5-2 and 4.6.2.5-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.5-3 and 4.6.2.5-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

Table 4.6.2.5.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 [25], Table 4.6.3-20 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| sr-ConfigIndex | 23 |  | TDD |
| } |  |  |  |
| } |  |  |  |

4.6.2.5.5 Test requirement

Table 4.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.5.5-1: Cell specific test parameters for EN-DC inter-frequency  
event triggered reporting with SSB time index detection

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
|  |  | Config 2,5 | TRS.1.1 TDD | | NA | |
|  |  | Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR 2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR 2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  | Config 2,5 | CCR.1.1 TDD | |
|  | Config 3,6 | CCR 2.1 TDD | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | AWGN | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection

4.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A. 4.6.2.6.

4.6.2.6.4 Test description

4.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.6.4.1-2. Test environment parameters are given in Table 4.6.2.6.4.1-3.

Table 4.6.2.6.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX  
with SSB time index detection supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.6.2.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

Table 4.6.2.6.4.1-2: General test parameters for EN-DC inter-frequency  
event triggered reporting with SSB time index detection in DRX

| Parameter | Unit | Test configuration | Value | | | | Comment |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | | 4 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | | 9 | |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.3 | 13.5 | 1.3 | 13.5 |  |

Table 4.6.2.6.4.1-3: Test Environment parameters for EN-DC inter-frequency  
event triggered reporting with SSB time index detection in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.2.6.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.6.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 4.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 4.6.2.6.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.6.4.1-2 and Table 4.6.2.6.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.6.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1, 12160 ms for Test 2, 1280 ms for Test 3 and 12160 ms for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.6.4.1-2 as appropriate.

4.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.6.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1  
event triggered reporting in DRX with SSB test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ  Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ and SSB Index  Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3  Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3  Table H.3.4-4 with Condition gapUE for Test 1 and Test 2  Table H.3.4-4 with Condition gapFR1 for Test 3 and Test 4  Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 and Test 2  Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 3 and Test 4 |
| Specific message contents exceptions for Test Configuration 4.6.2.6-1 and 4.6.2.6-4 | Table H.3.1-3 with Conditions INTER-FREQ MO  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.6-2 and 4.6.2.6-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.6-3 and 4.6.2.6-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

Table 4.6.2.6.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 [25], Table 4.6.3-20 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| sr-ConfigIndex | 23 |  | TDD |
| } |  |  |  |
| } |  |  |  |

4.6.2.6.5 Test requirement

Table 4.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.6.5-1: Cell specific test parameters for EN-DC inter-frequency  
event triggered reporting with SSB time index detection

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | | |
| Duplex mode |  | Config 1,4 | FDD | | | | |
|  | Config 2,3,5,6 | TDD | | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | |
| OCNG Patterns |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR 2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR 2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | | |
|  | Config 2,5 | CCR.1.1 TDD | |
|  | Config 3,6 | CCR 2.1 TDD | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | | | |
|  |  | Config 3,6 | TDDConf.2.1 | | | | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | | | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | | | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | | | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | | | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | | N/A | |
|  | Config 2,5 | TRS.1.1 TDD | | | N/A | |
|  | Config 3,6 | TRS.1.2 TDD | | | N/A | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | | |
| Config 3,6 | 30 | | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | | |
| Config 3,6 | -95 | | -95 | | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | | -91 |
| Config 3,6 | -91 | -91 | -Infinity | | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. with a confidence level of 95%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.2.7 Void

#### 4.6.2.8 Void

#### 4.6.2.9 EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

4.6.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasInterFreq-r17. This test will partly verify the EN-DC inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4.

4.6.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced inter-frequency NR measurement requirements in high-speed scenario

4.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.2.0

The normative reference for this requirement is TS 38.133 [6] clause 4.6.2.9

4.6.2.9.4 Test description

4.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.9.4.1-1.

Table 4.6.2.9.4.1-1: Supported test configurations for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.2.9-1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.2.9-2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.2.9-3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.6.2.9-4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.2.9-5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.2.9-6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.2.9.4.1-2.

Table 4.6.2.9.4.1-2: Initial conditions for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 4.6.2.9.4.1-3.

2. Message contents are defined in clause 4.6.2.9.4.3.

3. There are three cells in the test, LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

Table 4.6.2.9.4.1-3: General test parameters for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Value | | Comment |
|  |  | configuration | Test 1 | Test 2 |  |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | 19 |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.4 | | As specified in clause A.3.3 |
| Time offset between PCell and PSCell | μs | Config 1,2,3,4,5,6 | 3 | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | ms | Config 1,4 | 3 | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| μs | Config 2,3,5,6 | 3 | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | [5] | |  |
| T2 | s | Config 1,2,3,4,5,6 | [3] | |  |

4.6.2.9.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (LTE Cell 1), PSCell (NR Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.2.9.4.3.

4. Set the parameters according to T1 in Table 4.6.2.9.4.1-2 and Table 4.6.2.9.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

5. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1 with event A3 configured for NR cell 3.

6. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.9.5-1. T2 starts.

8. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2240 ms for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

9. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. The SS shall transmit RRCConnectionReconfiguration message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 4.6.2.6.4.1-2 as appropriate.

4.6.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.9.4.3-1: Common Exception messages for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-2 with Condition DRX.4  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3  Table H.3.4-4 with Condition gapUE for Test 1  Table H.3.4-4 with Condition gapFR1 for Test 2  Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1  Table H.3.4-5 with Condition Pattern #4 and gap offset = 19 for Test 2 |
| Specific message contents exceptions for Test Configuration 4.6.2.9-1 and 4.6.2.9-4 | Table H.3.1-3 with Conditions INTER-FREQ MO  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.9-2 and 4.6.2.9-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.9-3 and 4.6.2.9-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

Table 4.6.1.9.4.3-2: ServingCellConfigCommon

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { |  |  |  |
| HighSpeedConfig-v1700 SEQUENCE { |  |  |  |
| highSpeedMeasCA-Scell-r17 | true |  |  |
| } |  |  |  |
| } |  |  |  |

4.6.2.9.5 Test requirement

Table 4.6.2.9.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 4.6.2.9.5-1: NR cell specific test parameters for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Cell 2 | | Cell 3 | |
|  |  | configuration | T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  |  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
|  |  | Config 2,5 | 10: NRB,c = 52 | | | |
|  |  | Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
|  |  | Config 2,5 | 10: NRB,c = 52 | | | |
|  |  | Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | | |
|  |  | Config 3,6 | TDDConf.2.1 | | | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
|  |  | Config 2,5 | TRS.1.1 TDD | | NA | |
|  |  | Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference |  | Config 1,4 | SR.1.1 FDD | | - | |
| measurement channel |  | Config 2,5 | SR.1.1 TDD | |  | |
|  |  | Config 3,6 | SR.2.1 TDD | |  | |
| CORESET Reference |  | Config 1,4 | CR.1.1 FDD | | - | |
| Channel |  | Config 2,5 | CR.1.1 TDD | |  | |
|  |  | Config 3,6 | CR.2.1 TDD | |  | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  |  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  |  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | | |
|  | Config 2,3,5,6 | SMTC.1 | | | |
| CSI-RS configuration for RRM |  | Config 1,4 | CSI-RS.RRM.FR1.1 FDD | | | |
|  | Config 2,5 | CSI-RS.RRM.FR1.1 TDD | | | |
| Config 3,6 | CSI-RS.RRM.FR1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
|  |  | Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS |  | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | |  | |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
|  |  | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
|  |  | Config 3,6 | -91 | -91 | -Infinity | -88 |
| CSI-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
|  |  | Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
|  | dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 1 and 2 UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 4.6.3 Void

### 4.6.4 L1-RSRP measurement for beam reporting

#### 4.6.4.0 Minimum conformance requirements

##### 4.6.4.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_SSB.

The value of TL1-RSRP\_Measurement\_Period\_SSB is defined in Table 9.5.4.1-1 for FR1,

where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

For FR1,

- P=, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Where:

TSSB = ssb-periodicityServingCell

TSMTCperiod = the configured SMTC period

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*. TSMTCperiod is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

Table 9.5.4.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| NOTE 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  NOTE 2: K = 1 when TSSB ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.214 [24].

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If SSB and CSI-RS have different SCS,

- If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

4.6.4.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_CSI-RS.

The value of TL1-RSRP\_Measurement\_Period\_CSI-RS is defined in Table 9.5.4.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- P=, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

TCSI-RS = the periodicity of CSI-RS configured for L1-RSRP measurement

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

Table 9.5.4.2-1: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_CSI-RS (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| NOTE 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.  NOTE 3: K = 1 when TCSI-RS ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 36.300 [24].

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

#### 4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX

4.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

4.6.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.1.

4.6.4.1.4 Test description

4.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.1.4.1-2. Test environment parameters are given in Table 4.6.4.1.4.1-3.

Table 4.6.4.1.4.1-1: EN-DC SSB based L1-RSRP measurement supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.6.4.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.1-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.4.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.1-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table 4.6.4.1.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement

| Parameter | Config | Unit | Value |
| --- | --- | --- | --- |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | Off |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity | 1~6 |  | ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.4.1.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.4.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

4.6.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.6.4.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 4.6.4.1.5-1. T1 starts.

5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

6. When T1 expires, the SS shall set the parameters according to T2 in 4.6.4.1.5-1. T2 starts.

7. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and Table 4.6.4.1.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 4.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.1.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS waits until T2 expires.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.4.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with conditions SSB and PERIODIC  Table H.3.4-1 |

Table 4.6.4.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

##### 4.6.4.1.5 Test requirement

Table 4.6.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.1.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| 3,6 | -91.65 | | | |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| 3,6 | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |

The UE shall send L1-RSRP report every 80 slots. After 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.1.5-2 for for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.1.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.1.5-4 for all test configurations.

Table 4.6.4.1.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

Table 4.6.4.1.5-3: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

Table 4.6.4.1.5-4: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX

4.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of SSB-based L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

4.6.4.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

##### 4.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.2.

4.6.4.2.4 Test description

4.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.2.4.1-2. Test environment parameters are given in Table 4.6.4.2.4.1-3.

Table 4.6.4.2.4.1-1: EN-DC SSB based L1-RSRP measurement in DRX supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table 4.6.4.2.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement in DRX

| Parameter | Config | Unit | Value |
| --- | --- | --- | --- |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity | 1~6 |  | ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.4.2.4.1-3: Test Environment parameters for EN-DC SSB  
based L1-RSRP measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.4.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.2.4.1-2.

4.6.4.2.4.2 Test procedure

Same test procedure as in subclause 4.6.4.1.4.2 with tables 4.6.4.1.4.1-2 and 4.6.4.1.5-1 replaced by tables 4.6.4.2.4.1-2 and 4.6.4.2.5-1.

4.6.4.2.4.3 Message contents

Same message content as in subclause 4.6.4.1.4.3 with the following exception:

Table 4.6.4.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

4.6.4.2.5 Test requirement

Table 4.6.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.2.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| 3,6 | -91.65 | | | |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| 3,6 | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.2.5-2 for for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.2.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.2.5-4 for all test configurations.

Table 4.6.4.2.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

Table 4.6.4.2.5-3: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

Table 4.6.4.2.5-4: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX

4.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

4.6.4.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.3.

4.6.4.3.4 Test description

4.6.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.3.4.1-2. Test environment parameters are given in Table 4.6.4.3.4.1-3.

Table 4.6.4.3.4.1-1: EN-DC CSI-RS based L1-RSRP measurement supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.6.4.3-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.3-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.3-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.4.3-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.3-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.3-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table 4.6.4.3.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement

| **Parameter** | **Config** | **Unit** | **Value** |
| --- | --- | --- | --- |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS 1.3 FDD |
| 2,5 | CSI-RS 1.3 TDD |
| 3,6 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | Off |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity | 1~6 |  | cri-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.4.3.4.1-3: Test Environment parameters for EN-DC CSI-RS L1-RSRP measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.4.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs.

4.6.4.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 4.6.4.3.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.4.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 0 for configuration 1,2,4,5 and slot 8 for configuration 3,6. The corresponding CSI-RS set is transmitted with the offset of 0 slots after the DCI trigger.

4. The SS shall check following requirements:

R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: The L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.4.3.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.3.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 4.6.4.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. Void

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.4.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | TBD |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions APERIODIC and CSI-RSRP  Table H.3.6-3 with conditions CSI-RS and APERIODIC  Table H.3.4-1  TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC |

Table 4.6.4.3.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

4.6.4.3.5 Test requirement

Table 4.6.4.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.3.5-1: CSI-RS specific test parameters for EN-DC CSI-RS L1-RSRP measurement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.15 |
| 3,6 | -91.65 | -88.14 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.59 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.49 |
|  | 1~6 | dB | 0 | 3.5 |
| NOTE 1: Void.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the beginning of T2. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.3.5-2 for for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 4.6.4.3.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.3.5-4 for all test configurations.

Table 4.6.4.3.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 75 |

Table 4.6.4.3.5-3: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 78 |

Table 4.6.4.3.5-4: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX

4.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

4.6.4.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.4.

4.6.4.4.4 Test description

4.6.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.4.4.1-2. Test environment parameters are given in Table 4.6.4.4.4.1-3.

Table 4.6.4.4.4.1-1: EN-DC CSI-RS based L1-RSRP measurement  
in DRX supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table 4.6.4.4.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement in DRX

| **Parameter** | **Config** | **Unit** | **Value** |
| --- | --- | --- | --- |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS 1.3 FDD |
| 2,5 | CSI-RS 1.3 TDD |
| 3,6 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity | 1~6 |  | cri-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.4.4.4.1-3: Test Environment parameters for EN-DC CSI-RS  
based L1-RSRP measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.4.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.4.4.1-2.

4.6.4.4.4.2 Test procedure

Same test procedure as in subclause 4.6.4.3.4.2 with tables 4.6.4.3.4.1-2 and 4.6.4.3.5-1 replaced by tables 4.6.4.4.4.1-2 and 4.6.4.4.5-1.

4.6.4.4.4.3 Message contents

Same message content as in subclause 4.6.4.3.4.3 with the following exception:

Table 4.6.4.4.4.3-1: Common Exception messages EN-DC CSI-RS  
based L1-RSRP measurement in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 and Offset |

4.6.4.4.5 Test requirement

Table 4.6.4.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.4.5-1: CSI-RS specific test parameters for EN-DC SSB  
based L1-RSRP measurement in DRX

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| --- | --- | --- | --- | --- |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.15 |
| 3,6 | -91.65 | -88.14 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.59 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.49 |
|  | 1~6 | dB | 0 | 3.5 |
| NOTE 1: Void.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.4.5-2 for for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.4.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.4.5-4 for all test configurations.

Table 4.6.4.4.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 75 |

Table 4.6.4.4.5-3: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 78 |

Table 4.6.4.4.5-4: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-     The feasibility of configuring different channel models to different SSBs needs further study.

-     The TT analysis may need to be redone after concluding if the new test configuration is testable.

4.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*.

To verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in TS 38.133 [6] clause 9.5.4.1.

4.6.4.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, HST enhancement and long DRX cycle.

4.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.5.

4.6.4.5.4 Test description

4.6.4.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.5.4.1-2. Test environment parameters are given in Table 4.6.4.5.4.1-3.

Table 4.6.4.5.4.1-1: Supported test configurations for EN-DC FR1 SSB-based  
L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

|  |  |
| --- | --- |
| Config | Description |
| 4.6.4.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.4.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.4.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.6.4.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.4.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.4.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table 4.6.4.5.4.1-2: General test parameters for EN-DC FR1 SSB-based  
L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

| Parameter | Config | Unit | Value |
| --- | --- | --- | --- |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
|  | 2,5 |  | TDD |
|  | 3,6 |  | TDD |
| TDD Configuration | 1,4 |  | N/A |
|  | 2,5 |  | TDDConf.1.1 |
|  | 3,6 |  | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
|  | 2,5 |  | 10: NRB,c = 52 |
|  | 3,6 |  | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
|  | 2,5 |  | SR.1.1 TDD |
|  | 3,6 |  | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
|  | 2,5 |  | CR.1.1 TDD |
|  | 3,6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
|  | 2,5 |  | CCR.1.1 TDD |
|  | 3,6 |  | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
|  | 2,5 |  | SSB.3 FR1 |
|  | 3,6 |  | SSB.4 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity | 1~6 |  | ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 2 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.4.5.4.1-3: Test Environment parameters for EN-DC FR1 SSB-based  
L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.4.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.5.4.1-2.

4.6.4.5.4.2 Test procedure

Same test procedure as in subclause 4.6.4.1.4.2 with tables 4.6.4.1.4.1-2 and 4.6.4.1.5-1 replaced by tables 4.6.4.5.4.1-2 and 4.6.4.5.5-1. Step 7 is also replaced by the following step.

7. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5 and Table 4.6.4.5.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 4.6.4.5.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.5.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.5.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

4.6.4.5.4.3 Message contents

In addition to the same message contents as clause 4.6.4.2.4.3, the following exceptions are also needed:

Table 4.6.4.5.4.3-1: Void

Table 4.6.4.5.4.3-2: Void

Table 4.6.4.5.4.3-3: CellGroupConfig (Step 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition EN-DC | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex for Cell 2 |  |  |
| reconfigurationWithSync SEQUENCE { |  |  |  |
| spCellConfigCommon | ServingCellConfigCommon | Table 4.6.4.5.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.4.5.4.3-4: ServingCellConfigCommon (Table 4.6.4.5.4.3-3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition HST | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { |  |  |  |
| highSpeedConfig-r16 SEQUENCE { |  |  |  |
| highSpeedMeasFlag-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |

4.6.4.5.5 Test requirement

Table 4.6.4.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.5.5-1: SSB specific test parameters for EN-DC FR1 SSB-based  
L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| 3,6 | -91.65 | | | |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| 3,6 | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| Propagation conditions | 1,2,4,5 |  | AWGN | | AWGN 1944 HzNote4 | |
| 3,6 | AWGN | | AWGN 3334 Hz Note5 | |
| NOTE 1 The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.  Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz. | | | | | | |

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.5.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.5.5-4 for all test configurations.

Table 4.6.4.5.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

Table 4.6.4.5.5-3: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

Table 4.6.4.5.5-4: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 4.6.5 CLI measurements

#### 4.6.5.0 Minimum conformance requirements

4.6.5.0.1 Minimum conformance requirements for SRS-RSRP measurement

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of TSRS\_RSRP\_measurement\_period for FR1 and FR2.

Table 4.6.5.0.1‑ Measurement period TSRS\_RSRP\_measurement\_period

|  |  |
| --- | --- |
| Configuration | TSRS\_measurement\_period (ms) |
| No DRX | Max(60, 3 X TSRS) |
| DRX cycle ≤ 320ms | Max(60, Ceil(1.5 X 3) X max(TSRS, TDRX)) |
| DRX cycle > 320ms | 3 X TDRX |
| NOTE: TSRS is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and TDRX is the DRX cycle length. | |

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for TSRS\_RSRP\_measurement\_period.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements apply, provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 of TS 38.133 [6] for FR1 and FR2 for a corresponding band,

- SRS\_RP and SRS Ês/Iot according to Annex B.2.7 of TS 38.133 [6] for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 of TS 38.133[6] for FR1 and FR2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5, 9.7.2.1, 9.7.2.2 and 9.7.2.3.3.

##### 4.6.5.0.2 Minimum conformance requirements for CLI-RSSI measurement with non-DRX

The UE shall be capable of performing CLI-RSSI measurement based on the configured measurement resource within TCLI\_RSSI\_measurement\_period. The UE shall be able to provide a single RSSI sample for each measurement resource configured for CLI-RSSI measurement occurring with a configured periodicity. The CLI-RSSI measurement period TCLI\_RSSI\_measurement\_period corresponds to the CLI-RSSI measurement resource periodicity, which is configured for by higher layers via RSSI-PeriodicityAndOffset.

If the CLI-RSSI measurement resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for TCLI\_RSSI\_measurement\_period.

The UE shall send CLI-RSSI reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when CLI-RSSI report is configured.

The requirements apply, provided:

- The measurement resources configured for CLI-RSSI measurements are measurable.

A measurement resource configured for CLI-RSSI shall be considered measurable when for each relevant CLI-RSSI resource the following conditions are met:

- CLI-RSSI related side conditions given in clauses 10.1.22.2 of TS 38.133 [6] for FR1 and FR2 for a corresponding band.

The UE shall report the CLI-RSSI value as a 7-bit value in the range [-100, -25] dBm with 1dB step size according to clause 10.1.22.2 of TS 38.133[6] for FR1 and FR2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clauses 9.7.3.5, 9.7.3.1 and 9.7.3.3.2.

#### 4.6.5.1 EN-DC FR1 SRS-RSRP measurement with non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Test Requirements and length of T2 are in brackets as they need further study.

4.6.5.1.1 Test purpose

To verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 4.6.5.0.

4.6.5.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting NR EN-DC and CLI-based SRS-RSRP measurements.

##### 4.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.5.1.

4.6.5.1.4 Test description

The test scenario comprises of one E-UTRA anchor cell (Cell 1), one serving NR FR1 PSCell (Cell 2) and one virtual intra-frequency UE transmitting SRS periodically, which are the target of the CLI measurement report evaluated in the test. The test parameters for PSCell are given in Table 4.6.5.1.4.1-3 and Table 4.6.5.1.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with event I1 is used. No gap pattern is configured in the test.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 4.6.5.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 4.6.5.1.5-2. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

4.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.5.1.4.1-1.

Table 4.6.5.1.4.1-1: Supported test configurations for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 4.6.5.1-1 | NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.5.1-2 | NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

2Initial conditions for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | |  |
|  |  | |  |
|  |  | | |
|  | 1 | | |
|  |  | |  |
|  |  |  |  |
|  |  |
|  |  | |  |

1. Message contents are defined in clause 4.6.5.1.4.3.

2. Cell 1 is the E-UTRA anchor cell for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with power levels and settings according to Annex C.1.2 and C.1.3. Virtual UE 1 is the target for SRS-RSRP measurements.

3. The test parameters are given in Table 4.6.5.1.4.1-3.

Table 4.6.5.1.4.1-3: General test parameters for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 |  |
| RF Channel Number |  | 1, 2 | 1: Cell 1  2: Cell 2 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
|  |  | 2 | SMTC.1 |  |
| SRS configuration |  | 1 | SRSConf.1 | Table 4.6.5.1.5-3 |
|  |  | 2 | SRSConf.2 |  |
| CP length |  | 1, 2 | Normal |  |
| i1-Threshold | dBm | 1 | -97 |  |
|  |  | 2 | -95 |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | OFF | Non-DRX |
| Time offset between DL from serving cell and SRS from test system | μs | 1,2 | 17.67 |  |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | [1] |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | |  |
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|  |  | | |
|  |  | |  |
|  |  |  |  |
|  |  |
|  |  | |  |

4.6.5.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During T1 only the serving NR PCell is powered on, but at the start of T2 the virtual UE is powered on and starts transmitting on SRS resources, in addition to the serving NR cell which is kept powered on. The purpose of the test is to evaluate the event i1 reporting delay upon a newly powered up virtual UE, from the start of T2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.5.1.4.1-3, Table 4.6.5.1.5-1 and Table 4.6.5.1.5-2.

3. The SS shall transmit an *RRCReconfiguration* message, embedded in an *RRCConnectionReconfiguration* message, configuring a CLI measurement object with a CLI event I1 trigger, as specified in section 4.6.5.1.4.3.

4. The UE shall transmit *RRCReconfigurationComplete* message, embedded in an *RRCConnectionReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.5.1.4.1-3, Table 4.6.5.1.5-1 and Table 4.6.5.1.5-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message, embedded in an *ULInformationTransferMRDC* message, triggered by event I1, as specified in section 4.6.5.1.4.3. If the overall delay measured from the beginning of time period T2 is less than [62] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall requirement delay, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Repeat steps 1-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 4.6.5.1.4.3-1: Common Exception messages for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-5  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3 |

Table 4.6.5.1.4.3-2: *MeasObjectToAddModList* for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 1 entry |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectCLI-r16 | MeasObjectCLI-r16 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.5.1.4.3-3: *MeasObjectCLI-r16* for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectCLI-r16 ::= SEQUENCE { |  |  |  |
| cli-ResourceConfig-r16 SEQUENCE { |  |  |  |
| srs-ResourceConfig-r16 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| SRS-ResourceListConfigCLI-r16 SEQUENCE { | 1 entry |  |  |
| srs-Resource-r16 | SRSConf.1 | entry 1 | Config 1 |
|  | SRSConf.2 | entry 1 | Config 2 |
| srs-SCS-r16 | kHz15 |  | Config 1 |
|  | kHz30 |  | Config 2 |
| refServCellIndex-r16 | 0 | PCell |  |
| refBWP-r16 | 0 | BWP-0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.5.1.4.3-4: *ReportConfigNR* for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| cli-EventTriggered-r16 SEQUENCE { |  |  |  |
| eventId-r16 CHOICE { |  |  |  |
| eventI1-r16 SEQUENCE { |  | Event I1 |  |
| i1-ThresholdCHOICE { |  |  |  |
| srs-RSRP-r16 | 43 | 43 = -97-(-140) | Config 1 |
| srs-RSRP-r16 | 45 | 45 = -95-(-140) | Config 2 |
| } |  |  |  |
| reportOnLeave-r16 | False |  |  |
| hysteresis-16 | 0 |  |  |
| timeToTrigger-r16 | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| reportInterval-r16 | ms120 | Not critical to the test |  |
| reportAmount-r16 | r2 | Similar to other measurement tests |  |
| maxReportCLI-r16 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.6.5.1.4.3-5: *MeasResultCLI-r16* for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultCLI-r16 ::= SEQUENCE { |  |  |  |
| measResultsListSRS-r16 CHOICE { |  |  |  |
| srs-ResourceId-r16 | SRS-ResourceId |  |  |
| srs-RSRP-Result-r16 | SRS-RSRP-Range-r16 | INTEGER (0..98) |  |
| } |  |  |  |
| } |  |  |  |

4.6.5.1.5 Test requirement

Table 4.6.5.1.5-1 and Table 4.6.5.1-2 define the primary level settings including test tolerances for EN-DC FR1 SRS-RSRP measurement with non-DRX. Table 4.6.5.1.5-3 defines the SRS resource configurations.

Table 4.6.5.1.5-1: NR Cell specific test parameters for EN-DC FR1 SRS-RSRP measurement with non-DRX

| Parameter | Unit | Test | Cell 2 | |
| --- | --- | --- | --- | --- |
|  |  | configuration | T1 | T2 |
| TDD configuration |  | 1 | TDDConf.1.1 | |
|  |  | 2 | TDDConf.2.1 | |
| PDSCH RMC |  | 1 | SR.1.1 TDD | |
| configuration |  | 2 | SR.2.1 TDD | |
| RMSI CORESET RMC |  | 1 | CR.1.1 TDD | |
| configuration |  | 2 | CR.2.1 TDD | |
| Dedicated CORESET |  | 1 | CCR.1.1 TDD | |
| RMC configuration |  | 2 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2 | OP.1 | |
| TRS Configuration |  | 1 | TRS.1.1 TDD | |
|  |  | 2 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | |
| Note 2 | dBm/15 kHz | 1 | -98 | |
|  |  | 2 |  | |
| Note 2 | dBm/SCS | 1 | -98 | |
|  |  | 2 | -95 | |
| Propagation Condition |  | 1, 2 | AWGN | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

Table 4.6.5.1.5-2: Neighbor UE specific test parameters for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Neighbour cell UE | |
|  |  | configuration | T1 | T2 |
| Note 2 | dBm/15 kHz | 1 | -98 | |
|  |  | 2 |  | |
| Note 2 | dBm/SCS | 1 | -98 | |
|  |  | 2 | -95 | |
|  | dB | 1 | -infinity | 9.25 |
|  |  | 2 |  | 8.75 |
|  | dB | 1 | -infinity | 9.25 |
|  |  | 2 |  | 8.75 |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | -infinity | -88.75 |
|  |  | 2 | -infinity | -86.25 |
| Io | dBm/9.36 MHz | 1 | -70.05 | -60.62 |
|  | dBm/38.16 MHz | 2 | -63.96 | -57.51 |
| Propagation Condition |  | 1, 2 | AWGN | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

Table 4.6.5.1.5-3: SRS configurations for EN-DC FR1 SRS-RSRP measurement with non-DRX

|  | Field | SRSConf.1 | SRSConf.2 | Comments |
| --- | --- | --- | --- | --- |
| SRS- | srs-ResourceSetId | 0 | 0 |  |
| ResourceSet | srs-ResourceIdList | 0 | 0 |  |
|  | resourceType | Periodic | Periodic |  |
|  | Usage | Codebook | Codebook |  |
| SRS- | SRS-ResourceId | 0 | 0 |  |
| Resource | nrofSRS-Ports | Port1 | Port1 |  |
|  | transmissionComb | n2 | n2 |  |
|  | combOffset-n2 | 0 | 0 |  |
|  | cyclicShift-n2 | 0 | 0 |  |
|  | resourceMapping  startPosition | 0 | 0 |  |
|  | resourceMapping  nrofSymbols | n1 | n1 |  |
|  | resourceMapping  repetitionFactor | n1 | n1 |  |
|  | freqDomainPosition | 0 | 0 |  |
|  | freqDomainShift | 0 | 0 |  |
|  | freqHopping  c-SRS | 12 | 12 |  |
|  | freqHopping  b-SRS | 0 | 0 |  |
|  | freqHopping  b-hop | 0 | 0 |  |
|  | groupOrSequenceHopping | Neither | Neither |  |
|  | resourceType | Periodic | Periodic |  |
|  | periodicityAndOffset | sl20, 9 | sl40, 19 |  |
|  | sequenceId | 0 | 0 | Any 10 bit number |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than [60] ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Message contents are missing.

- Test Procedure might need update.

- Test applicability needs to be updated

4.6.5.2.1 Test purpose

To verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5.

4.6.5.2.2 Test applicability

FFS.

4.6.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.5.2.

4.6.5.2.4 Test description

4.6.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.5.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.5.2.4.1-2. Test environment parameters are given in Table 4.6.5.2.4.1-3.

Table 4.6.5.2.4.1-1: EN-DC FR1 CLI-RSSI measurement in non-DRX test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 15 kHz SCS, 10 MHz bandwidth, TDD duplex mode |
| 2 | NR 30 kHz SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table 4.6.5.2.4.1-2: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR1

| Parameter | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- |
| Active cell |  | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 |  |
| RF Channel Number |  | 1, 2 | 1: Cell 1  2: Cell 2 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
|  |  | 2 | SMTC.1 |  |
| CLI-RSSI configuration |  | 1 | CLI-RSSIConf.1 | Table 4.6.5.2.5-2 |
|  |  | 2 | CLI-RSSIConf.2 |  |
| CP length |  | 1, 2 | Normal |  |
| i1-Threshold | dBm | 1 | -93 |  |
|  |  | 2 | -93 |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | OFF | Non-DRX |
| Time offset between DL from serving cell and OCNG from test system | μs | 1,2 | 17.67 |  |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 1 |  |

Table 4.6.5.2.4.1-3: Test Environment parameters for EN-DC SSB based  
L1-RSRP measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.6.5.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CLI-RSSI measurements. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used.

4.6.5.2.4.2 Test procedure

FFS

4.6.5.2.4.3 Message contents

FFS

4.6.5.2.5 Test requirement

Table 4.6.5.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.5.2.5-1: NR Cell specific test parameters for CLI-RSSI event  
triggered reporting for PSCell in FR1

| Parameter | Unit | Test | Cell 2 | |
| --- | --- | --- | --- | --- |
|  |  | configuration | T1 | T2 |
| TDD configuration |  | 1 | TDDConf.1.1 | |
|  |  | 2 | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 TDD | |
|  |  | 2 | SR.2.1 TDD | |
| RMSI CORESET RMC |  | 1 | CR.1.1 TDD | |
| configuration |  | 2 | CR.2.1 TDD | |
| Dedicated CORESET RMC |  | 1 | CCR.1.1 TDD | |
| configuration |  | 2 | CCR.2.1 TDD | |
| OCNG Patterns Note 3 |  | 1, 2 | OP.1 | |
| TRS Configuration |  | 1 | TRS.1.1 TDD | |
|  |  | 2 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | |
| on CLI-RSSI | dBm/15 kHz | 1 | -116 | -108 |
| measurement resource Note 2 |  | 2 |  |  |
| on CLI-RSSI | dBm/SCS | 1 | -116 | -108 |
| measurement resource Note 2 |  | 2 | -113 | -105 |
| Io on CLI-RSSI | dBm/9.36 MHz | 1 | -88.05 | 79.55 |
| measurement resource | dBm/38.16 MHz | 2 | -81.96 | 73.5 |
| Io on CLI-RSSI | dBm/1.08 MHz | 1 | -97.43 | 88.93 |
| measurement resource | dBm/1.08 MHz | 2 | -97.44 | 88.94 |
| Propagation Condition |  | 1, 2 | AWGN | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

Table 4.6.5.2.5-2: CLI-RSSI measurement resource configuration for measurement reporting

|  |  |  |  |
| --- | --- | --- | --- |
|  | Field | CLI-RSSIConf.1 | CLI-RSSIConf.2 |
| RSSI- | rssi-ResourceId | 0 | 0 |
| Resource | rssi-SCS | 15 | 30 |
|  | startPRB | 0 | 0 |
|  | nrofPRBs | 52 | 106 |
|  | startPosition | 3 | 3 |
|  | nrofSymbols | 11 | 11 |
|  | rssi-PeriodicityAndOffset | sl20, 9 | sl40, 19 |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 4.6.6

### 4.6.7 L1-SINR measurement for beam reporting

#### 4.6.7.0 Minimum conformance requirements

4.6.7.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only is defined in Table 9.8.4.1-1 for FR1, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of P in FR1,

- P=, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

TSMTCperiod = the configured SMTC1 period or SMTC2 period if configured.

TCSI-RS = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 9.8.4.1-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

The UE is required to be capable of measuring L1-SINR without measurement gaps. The UE is required to perform the SSB and CSI-RS/CSI-IM measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.2.

4.6.7.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR is defined in Table 9.8.4.2-1 for FR1, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

P is defined as the maximum value between PCMR and PIMR, i.e., P = max(PCMR, PIMR), where

- the value of PCMR shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of PIMR shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 9.8.4.2-1: Measurement period TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

The UE shall transmit the periodic L1-SINR reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

Reported L1-SINR measurements contained in periodic L1-SINR measurement reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

For FR1, when the SSB configured as CMR for L1-SINR measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;

- If SSB and CSI-RS have different SCS,

- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;

- If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-SINR measurement is expected, and no requirements are defined.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

4.6.7.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR is defined in Table 9.8.4.3-1 for FR1, where

For the value of M,

- M=1 shall be applied if

- aperiodic NZP-CSI-RS as CMR or dedicated IMR, or

- aperiodic CSI-IMR as dedicated IMR, or

- periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or

- periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;

- M=3 otherwise.

P is defined as the maximum value between PCMR and PIMR, i.e., P = max(PCMR, PIMR), where

- The value of PCMR and PIMR shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 9.8.4.3-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.  Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

#### 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

4.6.7.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement based on CSI-RS CMR without dedicated IMR in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

4.6.7.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and L1-SINR measurement.

4.6.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.1.

4.6.7.1.4 Test description

4.6.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.1.4.1-2. Test environment parameters are given in Table 4.6.7.1.4.1-3.

Table 4.6.7.1.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 4.6.7.1.4.1-2: General test parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS.1.3 FDD |
| 2,5 | CSI-RS.1.3 TDD |
| 3,6 | CSI-RS.2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | Off |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity-r16 | 1~6 |  | cri-SINR-r16 |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 26 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.7.1.4.1-3: Test Environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | |  |

1. Message contents are defined in clause 4.6.7.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs.

4.6.7.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 4.6.7.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.7.1.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1,2,4,5 and slot 8 for configuration 3, 6. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. The report shall contain L1-SINR of both CSI-RS#0 and CSI-RS#1.

5. The SS shall check following requirements:

R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.7.1.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 4.6.7.1.5-4 for all test configurations or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.7.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR  Table H.3.6A-2 with conditions CSI-RS and APERIODIC |

Table 4.6.7.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

4.6.7.1.5 Test requirement

Table 4.6.7.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.7.1.5-1: CSI-RS specific test parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.65 |
| 3,6 | -91.65 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~6 | dB | 0 | 3 |
| Note 1: xxx?  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.1.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 4.6.7.1.5-4 for all test configurations.

Table 4.6.7.1.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 41 |
| Highest reported value (CSI-RS#1) | 64 |

Table 4.6.7.1.5-3:Void

Table 4.6.7.1.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest DIFF SINR reported (CSI-RS#0) | 0 |
| Highest DIFF SINR reported (CSI-RS#0) | 7 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

4.6.7.2.1 Test purpose

To verify that the UE makes correct reporting of SSB-based CMR and CSI-IM based IMR L1-SINR measurement in DRX within L1-SINR measurement requirements based in TS 38.133 [6] clause 9.8.4.2.

4.6.7.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 and long DRX cycle and L1-SINR measurement.

4.6.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.2.

4.6.7.2.4 Test description

4.6.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.2.4.1-2. Test environment parameters are given in Table 4.6.7.2.4.1-3.

Table 4.6.7.2.4.1-1: EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 4.6.7.2.4.1-2: General test parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-IM configuration | 1,4 |  | CSI-IM.1.1 FDD |
| 2,5 |  | CSI-IM.1.1 TDD |
| 3,6 |  | CSI-IM.2.1 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity-r16 | 1~6 |  | ssb-Index-SINR-r16 |
| Number of reported RS | 1~6 |  | 2 |
| L1-SINR reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.7.2.4.1-3: Test Environment parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.7.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1TBD | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4TBD |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | |  |

1. Message contents are defined in clause 4.6.7.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based CMR and CSI-IM based IMR L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD based on the SSBs. DRX is configured as specified in Table 4.6.7.2.4.1-2.

4.6.7.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.6.7.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.6.7.2.4.1-2.

2. Set the parameters according to T1 in Table 4.6.7.2.5-1. T1 starts.

5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

6. When T1 expires, the SS shall set the parameters according to T2 in 4.6.7.2.5-1. T2 starts.

7. The UE shall start sending L1-SINR reports. The SS shall check following requirements:

R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 in Table 4.6.7.2.5-2 for all test configurations and the relative L1-SINR requirement for SSB#0 in Table 4.6.7.2.5-4 for all test configurations. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.7.2.5-2 for all test configurations or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.7.2.5-2 for all test configurations or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one..

8. The SS waits until T2 expires.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.7.2.4.3-1: Common Exception messages EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-IM\_IMR  Table H.3.6A-2 with conditions SSB and PERIODIC  Table H.3.6A-4 with condition PERIODIC  Table H.3.7-1 with condition DRX.3 |

Table 4.6.7.2.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.6.7.2.5 Test requirement

Table 4.6.7.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.7.2.5-1: SSB specific test parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65+TT | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65+TT | | | |
| 3,6 | -91.65+TT | | | |
|  | 1~6 | dB | 0+TT | 0+TT | 0+TT | 0+TT |
| SS-RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65+TT | -94.65+TT | -94.65+TT | -94.65+TT |
| 3,6 | -91.65+TT | -91.65+TT | -91.65+TT | -91.65+TT |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69+TT | -63.69+TT | -63.69+TT | -63.69+TT |
| 3,6 | dBm/38.16 MHz | -57.59+TT | -57.59+TT | -57.59+TT | -57.59+TT |
|  | 1~6 | dB | 0+TT | 0+TT | 0+TT | 0+TT |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 4.6.7.2.5-4 for all test configurations.

Table 4.6.7.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | TBD43 |
| Highest reported value (SSB#1) | - | TBD62 |

Table 4.6.7.2.5-3: Void

Table 4.6.7.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest DIFF SINR reported (SSB#0) | - | TBD0 |
| Highest DIFF SINR reported (SSB#0) | - | TBD6 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

4.6.7.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based CMR and dedicated IMR L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

4.6.7.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 and L1-SINR measurement and long DRX cycle.

4.6.7.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.3.

4.6.7.3.4 Test description

4.6.7.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.3.4.1-2. Test environment parameters are given in Table 4.6.7.3.4.1-3.

Table 4.6.7.3.4.1-1: EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 4.6.7.3.4.1-2: General test parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration as CMR | 1,4 |  | CSI-RS.1.3 FDD |
| 2,5 | CSI-RS.1.3 TDD |
| 3,6 | CSI-RS.2.3 TDD |
| CSI-RS configuration as IMR | 1,4 |  | CSI-RS.1.2A FDD |
| 2,5 |  | CSI-RS.1.2A TDD |
| 3,6 |  | CSI-RS.2.2A TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity-r16 | 1~6 |  | cri-SINR-r16 |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 26 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 4.6.7.3.4.1-3: Test Environment parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.7.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | |  |

1. Message contents are defined in clause 4.6.7.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based CMR and dedicated IMR L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. DRX is configured as specified in Table 4.6.7.3.4.1-2.

4.6.7.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 4.6.7.3.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.7.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1,2,4,5 and slot 8 for configuration 3, 6. The corresponding CSI-RS as CMR and the associated CSI-RS as IMR are transmitted with the offset of 4 slots and 6 slots after the DCI trigger, respectively.

4. The UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. The report shall contain L1-SINR of both CSI-RS#0 and CSI-RS#1.

5. The SS shall check following requirements:

R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.7.3.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 4.6.7.3.5-4 for all test configurations or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC\_PSCell\_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG\_and\_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.7.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.7.3.4.3-1: Common Exception messages EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-RS\_IMR  Table H.3.6A-2 with conditions CSI-RS and APERIODIC  Table H.3.6A-3 with conditions APERIODIC  Table H.3.7-1 with condition DRX.3 |

4.6.7.3.5 Test requirement

Table 4.6.7.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.7.3.5-1: CSI-RS specific test parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0.5 | 3 |
|  | 1~6 | dB | 0.5 | 3 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.15 | -91.65 |
| 3,6 | -91.14 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.43 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.33 | -55.84 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.3.5-2 for all configurations and the corresponding relative accuracy requirements in Table 4.6.7.3.5-4 for all test configurations.

Table 4.6.7.3.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 44 |
| Highest reported value (CSI-RS#1) | 61 |

Table 4.6.7.3.5-3: Void

Table 4.6.7.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 5 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.7 Measurement performance requirements

### 4.7.1 SS-RSRP

#### 4.7.1.0 Minimum conformance requirements

4.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The intra-frequency SS-RSRP absolute accuracy requirements are defined for the SS-RSRP measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.1-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 4.7.1.0.1-1: SS-RSRP intra frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io Note 1 range** | | | | |
| **NR operating band groups Note 2** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCSSSB** | | **dBm/BWChannel** | **dBm/BWChannel** |
| **SCSSSB = 15 kHz** | **SCSSSB = 30 kHz** |
| ±4.5 | ±9 | ≥-6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -70 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -70 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -70 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -70 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -70 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -70 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A, NR\_FDD\_FR1\_B, NR\_TDD\_FR1\_C, NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D, NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E, NR\_FDD\_FR1\_G, NR\_FDD\_FR1\_H, | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in Section 3A.4.1 | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

Table 4.7.1.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping

| Reported value | Measured quantity value(L3 SS-RSRP) | Measured quantity value(L1 SS-RSRP and CSI-RSRP) | Unit |
| --- | --- | --- | --- |
| RSRP\_0 | SS-RSRP<-156 | Not valid | dBm |
| RSRP\_1 | -156≤ SS-RSRP<-155 | Not valid | dBm |
| RSRP\_2 | -155≤ SS-RSRP<-154 | Not valid | dBm |
| RSRP\_3 | -154≤ SS-RSRP<-153 | Not valid | dBm |
| RSRP\_4 | -153≤ SS-RSRP<-152 | Not valid | dBm |
| RSRP\_5 | -152≤ SS-RSRP<-151 | Not valid | dBm |
| RSRP\_6 | -151≤ SS-RSRP<-150 | Not valid | dBm |
| RSRP\_7 | -150≤ SS-RSRP<-149 | Not valid | dBm |
| RSRP\_8 | -149≤ SS-RSRP<-148 | Not valid | dBm |
| RSRP\_9 | -148≤ SS-RSRP<-147 | Not valid | dBm |
| RSRP\_10 | -147≤ SS-RSRP<-146 | Not valid | dBm |
| RSRP\_11 | -146≤ SS-RSRP<-145 | Not valid | dBm |
| RSRP\_12 | -145≤ SS-RSRP<-144 | Not valid | dBm |
| RSRP\_13 | -144≤ SS-RSRP<-143 | Not valid | dBm |
| RSRP\_14 | -143≤ SS-RSRP<-142 | Not valid | dBm |
| RSRP\_15 | -142≤ SS-RSRP<-141 | Not valid | dBm |
| RSRP\_16 | -141≤ SS-RSRP<-140 | RSRP<-140 | dBm |
| RSRP\_17 | -140≤ SS-RSRP<-139 | -140≤ RSRP<-139 | dBm |
| RSRP\_18 | -139≤ SS-RSRP<-138 | -139≤ RSRP<-138 | dBm |
| … | … |  | … |
| RSRP\_111 | -46≤ SS-RSRP<-45 | -46≤ RSRP<-45 | dBm |
| RSRP\_112 | -45≤ SS-RSRP<-44 | -45≤ RSRP<-44 | dBm |
| RSRP\_113 | -44≤ SS-RSRP<-43 | -44≤ RSRP | dBm |
| RSRP\_114 | -43≤ SS-RSRP<-42 | Not valid | dBm |
| RSRP\_115 | -42≤ SS-RSRP<-41 | Not valid | dBm |
| RSRP\_116 | -41≤ SS-RSRP<-40 | Not valid | dBm |
| RSRP\_117 | -40≤ SS-RSRP<-39 | Not valid | dBm |
| RSRP\_118 | -39≤ SS-RSRP<-38 | Not valid | dBm |
| RSRP\_119 | -38≤ SS-RSRP<-37 | Not valid | dBm |
| RSRP\_120 | -37≤ SS-RSRP<-36 | Not valid | dBm |
| RSRP\_121 | -36≤ SS-RSRP<-35 | Not valid | dBm |
| RSRP\_122 | -35≤ SS-RSRP<-34 | Not valid | dBm |
| RSRP\_123 | -34≤ SS-RSRP<-33 | Not valid | dBm |
| RSRP\_124 | -33≤ SS-RSRP<-32 | Not valid | dBm |
| RSRP\_125 | -32≤ SS-RSRP<-31 | Not valid | dBm |
| RSRP\_126 | -31≤ SS-RSRP | Not valid | dBm |
| RSRP\_1271 | Infinity | Infinity | dBm |
| NOTE: The value of RSRP\_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.6.

4.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

The intra-frequency relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency in FR1.

The accuracy requirements in Table 4.7.1.0.2-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 4.7.1.0.2-1: SS-RSRP Intra frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot Note 2** | **Io Note 1 range** | | | | |
| **NR operating band groups Note 4** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCSSSB** | | **dBm/BWChannel** | **dBm/BWChannel** |
| **SCSSSB = 15 kHz** | **SCSSSB = 30 kHz** |
| ±2 | ±3 | ≥-3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 4: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.2 and 10.1.6.

4.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP absolute accuracy requirements in this clause are defined for the SS-RSRP measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.3-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to clause B.2.3 for a corresponding Band for each relevant SSB.

Table 4.7.1.0.3-1: SS-RSRP inter frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot Note 2** | **Io Note 1 range** | | | | |
| **NR operating band groups Note 3** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCSSSB** | | **dBm/BWChannel** | **dBm/BWChannel** |
| **SCSSSB = 15 kHz** | **SCSSSB = 30 kHz** |
| ±4.5 | ±9 | ≥6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -70 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -70 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -70 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -70 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -70 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -70 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A, NR\_FDD\_FR1\_B, NR\_TDD\_FR1\_C, NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D, NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E, NR\_FDD\_FR1\_G, NR\_FDD\_FR1\_H, | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: Void.  NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.1 and 10.1.6.

4.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP relative accuracy requirements in this clause are defined for the SS-RSRP measured from one cell on a frequency in FR1compared to the SS-RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.1.0.4-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB,

- 

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

Table 4.7.1.0.4-1: SS-RSRP inter frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot Note 2** | **Io Note 1 range** | | | | |
| **NR operating band groups Note 3** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCSSSB** | | **dBm/BWChannel** | **dBm/BWChannel** |
| **SCSSSB = 15 kHz** | **SCSSSB = 30 kHz** |
| ±4.5 | ±6 | ≥6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.2 and 10.1.6.

#### 4.7.1.1 Intra-frequency measurements

4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy

4.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

4.7.1.1.1.4 Test description

4.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.1.4.1-1.

Table 4.7.1.1.1.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.1.1.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.1.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.1.4.1-2.

Table 4.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra frequency absolute accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.1.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.1.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 4.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.1.1.1.5-1 as appropriate and repeat steps 5-7.

4.7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.1.1.1.4.3-1: Common Exception messages for EN-DC FR1 SS-RSRP  
absolute measurement accuracy

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-5  Table H.3.1-7  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4 | Table H.3.1-3 with Condition SSB.1 FR1 and  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.1.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-RSRP Accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrq | false |  |  |
| sinr | false |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.1.1.1.5 Test requirement

Table 4.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-3 for test configurations 3 and 6.

Table 4.7.1.1.1.5-1: EN-DC FR1 SS-RSRP measurement accuracy test parameters

| Parameter | | | Unit | Test 1 | | | | Test 2 | | | Test 3 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | |  | Cell 2 | Cell 3 | | | Cell 2 | Cell 3 | | Cell 2 | | Cell 3 | |
| Physical cell ID | | |  | 489 | 0 | | | 489 | 0 | | 489 | | 0 | |
| SSB ARFCN | | |  | freq1 | | | | freq1 | | | freq1 | | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | | | | | | |
|  | | Config 2,3,5,6 |  | TDD | | | | | | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | | | | | | |
|  | | Config 2,5 |  | TDDConf.1.1 | | | | | | | | | | |
|  | | Config 3,6 |  | TDDConf.2.1 | | | | | | | | | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 2,5 |  | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 3,6 |  | 40: NRB,c = 106 | | | | | | | | | | |
| BWP BW | | Config 1,4 |  | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 2,5 |  | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 3,6 |  | 40: NRB,c = 106 | | | | | | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0 | | | | | | | | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1 | | | | | | | | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1 | | | | | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | | | | | |
| TRS Configuration | | Config 1,4 |  | TRS.1.1 FDD | | - | | TRS.1.1 FDD | - | | TRS.1.1 FDD | | | - |
|  | | Config 2,5 |  | TRS.1.1 TDD | |  | | TRS.1.1 TDD |  | | TRS.1.1 TDD | | |  |
|  | | Config 3,6 |  | TRS.2.1 TDD | |  | | TRS.2.1 TDD |  | | TRS.2.1 TDD | | |  |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | | - | | SR.1.1 FDD | - | | SR.1.1 FDD | | | - |
|  | | Config 2,5 |  | SR.1.1 TDD | |  | | SR.1.1 TDD |  | | SR.1.1 TDD | | |  |
|  | | Config 3,6 |  | SR.2.1 TDD | |  | | SR.2.1 TDD |  | | SR.2.1 TDD | | |  |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | | - | | CR.1.1 FDD | - | | CR.1.1 FDD | | | - |
|  | | Config 2,5 |  | CR.1.1 TDD | |  | | CR.1.1 TDD |  | | CR.1.1 TDD | | |  |
|  | | Config 3,6 |  | CR2.1 TDD | |  | | CR2.1 TDD |  | | CR2.1 TDD | | |  |
| Control Channel RMC | | Config 1,4 |  | CCR.1.1 FDD | | - | | CCR.1.1 FDD | - | | CCR.1.1 FDD | | | - |
|  | | Config 2,5 |  | CCR.1.1 TDD | |  | | CCR.1.1 TDD |  | | CCR.1.1 TDD | | |  |
|  | | Config 3,6 |  | CR2.1 TDD | |  | | CCR2.1 TDD |  | | CCR2.1 TDD | | |  |
| SSB configuration | | Config 1,4 |  | SSB 1.FR1 | | SSB.1 FR1 | | SSB 1.FR1 | SSB.1 FR1 | | SSB 1.FR1 | | | SSB.1 FR1 |
|  | | Config 2,5 |  | SSB 1.FR1 | | SSB.1 FR1 | | SSB 1.FR1 | SSB.1 FR1 | | SSB 1.FR1 | | | SSB.1 FR1 |
|  | | Config 3,6 |  | SSB 2.FR1 | | SSB.2 FR1 | | SSB 2.FR1 | SSB.2 FR1 | | SSB 2.FR1 | | | SSB.2 FR1 |
| Time offset with Cell 2 | | Config 1,4 | ms | - | | 3 | | - | 3 | | - | | | 3 |
|  | | Config 2,3,5,6 | μs | - | | 3 | | - | 3 | | - | | | 3 |
| SMTC Configuration | | Config 1,4 |  | SMTC.2 | | | | | | | | | | |
|  | | Config 2,3,5,6 |  | SMTC.1 | | | | | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | | | | | | | | | |
|  | | Config 3,6 |  | 30kHz | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | | 0 | | 0 | | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  | |  | |  | |  | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  | |  | |  | |  | |  |
| Note2 | Config 1,2,4,5 | Depending on band group | dBm/15KhZ | -107.5 | | | | -88 | | | | -116 + ΔBG\_offset | | |
|  | Config 3,6 | Depending on band group |  | -113.8 | | | | -94 | | | | -116 + ΔBG\_offset | | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -107.4 | | | | -88 | | | | Same as Noc/15kHz | | |
|  | Config 3,6 | Depending on band group |  | -110.8 | | | | -91 | | | | -113 + ΔBG\_offset | | |
|  | | | dB | 1.88 | | | -5.57 | 1.88 | | -5.57 | | 0.09 | | -5.56 |
|  | | | dB | 6 | | | 1.4 | 6 | | 1.4 | | 3 | | -0.8 |
| SS-RSRPNote3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -101.5 | | | -106.1 | -82 | | -86.6 | | -113 + ΔBG\_offset | | -116.8 + ΔBG\_offset |
|  | Config 3,6 | Depending on band group |  | -104.8 | | | -109.4 | -85 | | -89.6 | | -110+ ΔBG\_offset | | -113.8+ ΔBG\_offset |
| IoNote3 | Config 1,2,4,5 | Depending on band group | dBm/  9.36MHz | -71.68 | | | | -52.18 | | | | -82.39+ ΔBG\_offset | | |
|  | Config 3,6 | Depending on band group | dBm/  38.16MHz | -71.71 | | | | -51.91 | | | | -76.12 + ΔBG\_offset | | |
| Propagation condition | | | - | AWGN | | | | | | | | | | |
| Antenna configuration | | |  | 1x2 | | | | | | | | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | | | | | | | | |

Table 4.7.1.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

| Normal Conditions | Test 1  All bands | Test 2  All bands | Test 3 | |
| --- | --- | --- | --- | --- |
| Lowest reported value (Cell 3) | 44 | 60 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 34 |
| Bands NR\_FDD\_FR1\_B | 34 |
| Bands NR\_TDD\_FR1\_C | 35 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 35 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 36 |
| Bands NR\_FDD\_FR1\_G | 37 |
| Bands NR\_FDD\_FR1\_H | 37 |
| Highest reported value (Cell 3) | 56 | 79 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 46 |
| Bands NR\_FDD\_FR1\_B | 46 |
| Bands NR\_TDD\_FR1\_C | 47 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 47 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 48 |
| Bands NR\_FDD\_FR1\_G | 49 |
| Bands NR\_FDD\_FR1\_H | 49 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands | Test 3 | |
| Lowest reported value (Cell 3) | 40 | 57 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 29 |
| Bands NR\_FDD\_FR1\_B | 30 |
| Bands NR\_TDD\_FR1\_C | 30 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 31 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 31 |
| Bands NR\_FDD\_FR1\_G | 33 |
| Bands NR\_FDD\_FR1\_H | 34 |
| Highest reported value (Cell 3) | 61 | 82 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 50 |
| Bands NR\_FDD\_FR1\_B | 51 |
| Bands NR\_TDD\_FR1\_C | 51 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 52 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 52 |
| Bands NR\_FDD\_FR1\_G | 53 |
| Bands NR\_FDD\_FR1\_H | 54 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

Table 4.7.1.1.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2  All bands | Test 3 | |
| Lowest reported value (Cell 3) | 41 | 57 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 37 |
| Bands NR\_FDD\_FR1\_B | 37 |
| Bands NR\_TDD\_FR1\_C | 38 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 38 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 39 |
| Bands NR\_FDD\_FR1\_G | 40 |
| Bands NR\_FDD\_FR1\_H | 40 |
| Highest reported value (Cell 3) | 53 | 76 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 49 |
| Bands NR\_FDD\_FR1\_B | 49 |
| Bands NR\_TDD\_FR1\_C | 50 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 50 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 51 |
| Bands NR\_FDD\_FR1\_G | 52 |
| Bands NR\_FDD\_FR1\_H | 52 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands | Test 3 | |
| Lowest reported value (Cell 3) | 37 | 54 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 32 |
| Bands NR\_FDD\_FR1\_B | 33 |
| Bands NR\_TDD\_FR1\_C | 33 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 34 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 34 |
| Bands NR\_FDD\_FR1\_G | 35 |
| Bands NR\_FDD\_FR1\_H | 36 |
| Highest reported value (Cell 3) | 58 | 79 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 53 |
| Bands NR\_FDD\_FR1\_B | 54 |
| Bands NR\_TDD\_FR1\_C | 54 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 55 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 55 |
| Bands NR\_FDD\_FR1\_G | 56 |
| Bands NR\_FDD\_FR1\_H | 57 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy

4.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.1.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

4.7.1.1.2.4 Test description

4.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.2.4.1-1.

Table 4.7.1.1.2.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.1.1.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.1.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.2.4.1-2.

Table 4.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra frequency relative accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part  2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part  4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.1.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.1.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 2 and Cell 3 in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 4.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.1.1.2.5-1 as appropriate and repeat steps 5-7.

4.7.1.1.2.4.3 Message contents

Message contents are same as in clause 4.7.1.1.1.4.3.

4.7.1.1.2.5 Test requirement

Table 4.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.2.5-2.

Table 4.7.1.1.2.5-1: Same as Table 4.7.1.1.1.5-1 with the following exceptions:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | Test 2 | | | Test 3 | | | |
| Cell 2 | Cell 3 | | Cell 2 | Cell 3 | | Cell 2 | | Cell 3 | |
| Note2 | Config 1,2,4,5 | Depending on band group | dBm/15KhZ | -106 | | | -88 | | | | -116 + ΔBG\_offset | | |
| Config 3,6 | Depending on band group | -113 | | | -94 | | | | -116 + ΔBG\_offset | | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | Same as Noc/15kHz | | | Same as Noc/15kHz | | | | Same as Noc/15kHz | | |
| Config 3,6 | Depending on band group | -110 | | | -91 | | | | -113 + ΔBG\_offset | | |
|  | | | dB | 1.88 | | -4.97 | 1.88 | | -4.97 | | -0.01 | | -4.76 |
|  | | | dB | 6 | | 2 | 6 | | 2 | | 3 | | 0 |
| SS-RSRPNote3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -100 | | -104 | -82 | | -86 | | -113 + ΔBG\_offset | | -116 + ΔBG\_offset |
| Config 3,6 | Depending on band group | -104 | | -108 | -85 | | -89 | | -110 + ΔBG\_offset | | -113 + ΔBG\_offset |
| IoNote3 | Config 1,2,4,5 | Depending on band group | dBm/  9.36MHz | -70.05 | | | -52.05 | | | | -82.20+ ΔBG\_offset | | |
| Config 3,6 | Depending on band group | dBm/  38.16MHz | -70.77 | | | -51.77 | | | | -75.93 + ΔBG\_offset | | |

Table 4.7.1.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | RSRP\_x - 8 | RSRP\_x - 8 | RSRP\_x - 7 |
| Highest reported value (Cell 3) | RSRP\_x - 1 | RSRP\_x - 1 | RSRP\_x + 1 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | RSRP\_x - 8 | RSRP\_x - 8 | RSRP\_x - 7 |
| Highest reported value (Cell 3) | RSRP\_x - 1 | RSRP\_x - 1 | RSRP\_x + 1 |
| RSRP\_x is the reported value of Cell 2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.1.2 Inter-frequency measurements

4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy

4.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

4.7.1.2.1.4 Test description

4.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.1.4.1-1.

Table 4.7.1.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.1.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.1.4.1-2.

Table 4.7.1.2.1.4.1-2: Initial conditions for SS-RSRP inter frequency absolute accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.1.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.2.1.4.2 Test procedure

Same as in clause 4.7.1.1.1.4.2 but replacing Table 4.7.1.1.1.5-1 and 4.7.1.1.1.5-2 with 4.7.1.2.1.5-1 and 4.7.1.2.1.5-2, respectively.

4.7.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.1.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-RSRP  
absolute measurement accuracy

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED  Table H.3.1-5  Table H.3.1-7 with condition INTER-FREQ  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.1.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-RSRP Accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrq | false |  |  |
| sinr | false |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.1.2.1.5 Test requirement

Table 4.7.1.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.2.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.1.2.1.5-3 for test configurations 3 and 6.

Table 4.7.1.2.1.5-1: SS-RSRP inter-frequency test parameters

| **Parameter** | | **Config** | **Unit** | **Test 1** | | | **Test 2** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cell 2** | **Cell 3** | | **Cell 2** | **Cell 3** | |
| SSB ARFCN | | 1~6 |  | freq1 | freq2 | | freq1 | freq2 | |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| 2,5 | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| 3,6 | 40: NRB,c = 106 | | | 40: NRB,c = 106 | | |
| Gap pattern ID | |  |  | 0 | | | 0 | | |
| Duplex mode | | 1,4 |  | FDD | | | FDD | | |
| 2,5 | TDD | | | TDD | | |
| 3,6 | TDD | | | TDD | | |
| TDD configuration | | 1,4 |  | N/A | | | N/A | | |
| 2,5 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| 3,6 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - | |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 FDD | SR.2.1 FDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - | |
| 2,5 | CR.1.1 TDD | - | | CR.1.1 TDD | - | |
| 3,6 | CR.2.1 FDD | - | | CR.2.1 FDD | - | |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - | |
| 2,5 |  | CCR.1.1 TDD | - | | CCR.1.1 TDD | - | |
| 3,6 |  | CCR.2.1 TDD | - | | CCR.2.1 TDD | - | |
| SSB configuration | | 1,4 |  | SSB.1 FR1 | | | SSB.1 FR1 | | |
| 2,5 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| 3,6 | SSB.2 FR1 | | | SSB.2 FR1 | | |
| OCNG Patterns | | 1~6 |  | OP.1 | | | OP.1 | | |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | | - | TRS.1.1 FDD | | - |
| 2,5 | TRS.1.1 TDD | | TRS.1.1 TDD | |
| 3,6 | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | | | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | | | DLBWP.1.1  ULBWP.1.1 | | |
| SMTC configuration | | 1,4 |  | SMTC.2 | | | SMTC.2 | | |
| 2,3,5,6 |  | SMTC.1 | | | SMTC.1 | | |
| Time offset between Cell 2 and Cell 3 | | 1,4 | ms | 3 | | | 3 | | |
| 2,3,5,6 | μs | 3 | | | 3 | | |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 | | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -94.65 | | ( for Cell 3 +8dB) | -115+ ΔBG\_offset | |
| Note2 | Depending on band group | 3,6 | dBm/15kHz | -96 | -96 | | ( for Cell 3 +8dB) | -115+ ΔBG\_offset | |
| Note2 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | | ( for Cell 3 +8dB) | -115+ ΔBG\_offset | |
| Depending on band group | 3,6 | -93 | -93 | | ( for C 3 +8dB) | -112.00+ ΔBG\_offset | |
|  | | 1~6 | dB | 10 | 10 | | 13 | -3 | |
| SS-RSRPNote3 | Depending on band group | 1,2,4,5 | dBm/SCS | -84.65 | 84.65 | | (RSRP for Cell 3 +25dB) | -118.00+ ΔBG\_offset | |
| Depending on band group | 3,6 | -83 | -83 | | (RSRP for Cell 3 +25dB) | -115.00+ ΔBG\_offset | |
| IoNote3 | Depending on band group | 1,2,4,5 | dBm/  9.36MHz | 56.28 | 56.28 | | (Io for Channel 3 +19.75dB) | -85.28+ ΔBG\_offset | |
| Depending on band group | 3,6 | dBm/  38.16MHz | -51.53 | -51.53 | | (Io for Channel 3 +19.75dB) | -79.19+ ΔBG\_offset | |
|  | | 1~6 | dB | 10 | 10 | | 13 | -3 | |
| Propagation condition | | 1~6 | - | AWGN | | | AWGN | | |
| Antenna configuration | |  |  | 1x2 | | | 1x2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  NOTE 6: ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | | | |

Table 4.7.1.2.1.5-2: SS-RSRP Inter frequency absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 3) | 62 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 32 |
| Bands NR\_FDD\_FR1\_B | 33 |
| Bands NR\_TDD\_FR1\_C | 33 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 34 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 34 |
| Bands NR\_FDD\_FR1\_G | 35 |
| Bands NR\_FDD\_FR1\_H | 36 |
| Highest reported value (Cell 3) | 81 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 45 |
| Bands NR\_FDD\_FR1\_B | 45 |
| Bands NR\_TDD\_FR1\_C | 46 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 46 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 47 |
| Bands NR\_FDD\_FR1\_G | 48 |
| Bands NR\_FDD\_FR1\_H | 48 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 3) | 59 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 28 |
| Bands NR\_FDD\_FR1\_B | 28 |
| Bands NR\_TDD\_FR1\_C | 29 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 29 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 30 |
| Bands NR\_FDD\_FR1\_G | 31 |
| Bands NR\_FDD\_FR1\_H | 31 |
| Highest reported value (Cell 3) | 84 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 49 |
| Bands NR\_FDD\_FR1\_B | 50 |
| Bands NR\_TDD\_FR1\_C | 50 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 51 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 51 |
| Bands NR\_FDD\_FR1\_G | 52 |
| Bands NR\_FDD\_FR1\_H | 53 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

Table 4.7.1.2.1.5-3: SS-RSRP Inter frequency absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 3) | 64 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 35 |
| Bands NR\_FDD\_FR1\_B | 36 |
| Bands NR\_TDD\_FR1\_C | 36 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 37 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 37 |
| Bands NR\_FDD\_FR1\_G | 38 |
| Bands NR\_FDD\_FR1\_H | 39 |
| Highest reported value (Cell 3) | 83 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 48 |
| Bands NR\_FDD\_FR1\_B | 48 |
| Bands NR\_TDD\_FR1\_C | 49 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 49 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 50 |
| Bands NR\_FDD\_FR1\_G | 51 |
| Bands NR\_FDD\_FR1\_H | 51 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 3) | 61 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 31 |
| Bands NR\_FDD\_FR1\_B | 31 |
| Bands NR\_TDD\_FR1\_C | 32 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 32 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 33 |
| Bands NR\_FDD\_FR1\_G | 34 |
| Bands NR\_FDD\_FR1\_H | 34 |
| Highest reported value (Cell 3) | 86 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 52 |
| Bands NR\_FDD\_FR1\_B | 53 |
| Bands NR\_TDD\_FR1\_C | 53 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 54 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 54 |
| Bands NR\_FDD\_FR1\_G | 55 |
| Bands NR\_FDD\_FR1\_H | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy

4.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

4.7.1.2.2.4 Test description

4.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.2.4.1-1.

Table 4.7.1.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.1.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.2.4.1-2.

Table 4.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter frequency relative accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part  2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.1.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.2.2.4.2 Test procedure

Same as in clause 4.7.1.1.2.4.2 but replacing Table 4.7.1.1.2.5-1 and 4.7.1.1.2.5-2 with 4.7.1.2.2.5-1 and 4.7.1.2.2.5-2, respectively.

4.7.1.2.2.4.3 Message contents

Message contents are same as in clause 4.7.1.2.1.4.3.

4.7.1.2.2.5 Test requirement

Table 4.7.1.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.2.2.5-2.

**Table 4.7.1.2.2.5-1: same as Table 4.7.1.2.1.5-1**

Table 4.7.1.2.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRP\_x - 7 | SS-RSRP\_x - 31 |
| Highest reported value (Cell 3) | SS-RSRP\_x + 7 | SS-RSRP\_x - 18 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRP\_x - 9 | SS-RSRP\_x - 33 |
| Highest reported value (Cell 3) | SS-RSRP\_x + 9 | SS-RSRP\_x - 17 |
| SS-RSRP\_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.2 SS-RSRQ

#### 4.7.2.0 Minimum conformance requirements

4.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

The intra-frequency SS-RSRQ accuracy requirements are defined for the SS-RSRQ measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 4.7.2.0.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
| NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| ±2.5 | ±4 | ≥-3 dB | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.2.0.1-2: SS-RSRQ measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| SS-RSRQ\_0 | SS-RSRQ<-43 | dB |
| SS-RSRQ\_1 | -43≤ SS-RSRQ<-42.5 | dB |
| SS-RSRQ\_2 | -42.5≤ SS-RSRQ<-42 | dB |
| SS-RSRQ\_3 | -42≤ SS-RSRQ<-41.5 | dB |
| SS-RSRQ\_4 | -41.5≤ SS-RSRQ<-41 | dB |
| .. | .. | … |
| SS-RSRQ\_122 | 17.5≤ SS-RSRQ<18 | dB |
| SS-RSRQ\_123 | 18≤ SS-RSRQ<18.5 | dB |
| SS-RSRQ\_124 | 18.5≤ SS-RSRQ<19 | dB |
| SS-RSRQ\_125 | 19≤ SS-RSRQ<19.5 | dB |
| SS-RSRQ\_126 | 19.5≤ SS-RSRQ<20 | dB |
| SS-RSRQ\_127 | 20 ≤ SS-RSRQ | dB |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.7.1.1 and 10.1.11.

4.7.2.0.2 Inter-frequency absolute SS-RSRQ measurement accuracy requirements

The inter-frequency SS-RSRQ absolute accuracy requirements in this clause are defined for the SS-RSRQ measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.2.0.2-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 4.7.2.0.2-1: SS-RSRQ Inter frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
| NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| ±2.5 | ±4 | ≥-3 dB | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.9.1.1 and 10.1.11.

4.7.2.0.3 Inter-frequency relative SS-RSRQ measurement accuracy requirements

The inter-frequency SS-RSRQ relative accuracy requirements in this clause are defined for the SS-RSRQ measured from one cell on a frequency in FR1compared to the SS-RSRQ measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- |SSB\_RP1dBm - SSB\_RP2dBm| ≤ 27 dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

Table 4.7.2.0.3-1: SS-RSRQ Inter frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| ±3 | ±4 | ≥-3 dB | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 dB | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 4: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.9.1.2 and 10.1.11.

#### 4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy

4.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

4.7.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.1.

4.7.2.1.4 Test description

4.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.1.4.1-1.

Table 4.7.2.1.4.1-1: EN-DC FR1 SS-RSRQ measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.1.4.1-2.

Table 4.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra frequency accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.3.

4.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 4.7.2.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.2.1.5-1 as appropriate and repeat steps 5-7.

4.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.2.1.4.3-1: Common Exception messages for EN-DC FR1 SS-RSRQ measurement accuracy

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-5  Table H.3.1-7  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.7.2.1-1 and 4.7.2.1-4 | Table H.3.1-3 with Condition SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.2.1-2 and 4.7.2.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.2.1-3 and 4.7.2.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-RSRQ Accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrp | false |  |  |
| sinr | false |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.2.1.5 Test requirement

Table 4.7.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.1.5-2.

Table 4.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

| Parameter | | | Unit | Test 1 | | | Test 2 | | | Test 3 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cell 2 | Cell 3 | | Cell 2 | Cell 3 | | Cell 2 | | Cell 3 | |
| SSB ARFCN | | |  | freq1 | | | freq1 | | | freq1 | | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | | | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | | | | | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | | | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | |
| Dedicated DL BWP | DLBWP.1.1 | | | | | | | | | |
| Initial UL BWP | ULBWP.0.1 | | | | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - | | SR.1.1 FDD | | - | |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD | |
| Config 3,6 | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - | | CR.1.1 FDD | |  | |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD | |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD | |
| Control Channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - | | CCR.1.1 FDD | | - | |
| Config 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD | |
| Config 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | - | | TRS.1.1 FDD | - | | TRS.1.1 FDD | | - | |
| Config 2,5 | TRS.1.1 TDD | TRS.1.1 TDD | TRS.1.1 TDD | |
| Config 3,6 | TRS.1.2 TDD | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Patterns | | |  | OP. 1 | | | | | | | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | | | | | | | |
| Time offset with Cell 2 | | Config 2,3,5,6 | μs | - | | 3 | - | | 3 | | - | | 3 |
| Config 1,4 | ms | - | | 3 | - | | 3 | | - | | 3 |
| STMC configuration | | Config 2,3,5,6 |  | SMTC.1 | | | | | | | | | |
| Config 1,4 |  | SMTC.2 | | | | | | | | | |
| SSB configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | | | | | | | | |
| Config 3,6 | 30kHz | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | | 0 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -86.5 | | | -101 | | | -114+ ΔBG\_offset | | | |
| Config 3,6 | Depending on band group | -92.6 | | | - | | | -114+ ΔBG\_offset | | | |
| Note2 | Config 1,2,4,5 | Depending on band group | dBm/SC S | -86.5 | | | -101 | | | -114+ ΔBG\_offset | | | |
| Config 3,6 | Depending on band group | -89.6 | | | - | | | -111+ ΔBG\_offset | | | |
|  | | | dB | -1.76 | | | -4.7 | | | -5.46 | | -5.46 | |
|  | | | dB | 3 | 3 | | -2.9 | -2.9 | | -4 | | -4 | |
| SS-RSRPNote3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -83.5 | -83.5 | | -103.9 | -103.9 | | -118+ΔBG\_offset | | -118+ ΔBG\_offset | |
| Config 3,6 | Depending on band group | -86.6 | -86.6 | | - | - | | -115+ ΔBG\_offset | | -115+ ΔBG\_offset | |
| SS-RSRQ Note3 | |  | dB | -14.77 | -14.77 | | -16.76 | -16.76 | | -17.34 | | -17.34 | |
| IoNote3 | Config 1,2,4,5 | Depending on band group | dBm/  9.36MHz | -51.57 | | | -70 | | | -83.50+ ΔBG\_offset | | | |
| Config 3,6 | Depending on band group | dBm/  38.16MHz | -51.56 | | | - | | | -77.40+ ΔBG\_offset | | | |
| Propagation condition | | | - | AWGN | AWGN | | AWGN | AWGN | | AWGN | | AWGN | |
| Antenna configuration | | |  | 1x2 | 1x2 | | 1x2 | 1x2 | | 1x2 | | 1x2 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2.  NOTE 6: Subtest 2 is not used when testing with 30kHz SSB SCS.  NOTE 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | | | | | |

Table 4.7.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ\_52 | SS-RSRQ\_46 | SS-RSRQ\_44 |
| Highest reported value (Cell 3) | SS-RSRQ\_62 | SS-RSRQ\_60 | SS-RSRQ\_59 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ\_49 | SS-RSRQ\_45 | SS-RSRQ\_43 |
| Highest reported value (Cell 3) | SS-RSRQ\_65 | SS-RSRQ\_61 | SS-RSRQ\_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.2.2 Inter-Frequency SS-RSRQ measurement accuracy

##### 4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy

4.7.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

4.7.2.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.1.

4.7.2.2.1.4 Test description

4.7.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.1.4.1-1.

Table 4.7.2.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported  
test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.2.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.2.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.1.4.1-2.

Table 4.7.2.2.1.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.2.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.2.2.1.4.2 Test procedure

Same as in clause 4.7.2.1.4.2 but replacing Table 4.7.2.1.5-1 and 4.7.2.1.5-2 with 4.7.2.2.1.5-1 and 4.7.2.2.1.5-2, respectively.

4.7.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.2.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-RSRQ  
absolute measurement accuracy

| Default Message Contents | |
| --- | --- |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED  Table H.3.1-5  Table H.3.1-7 with condition INTER-FREQ  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.7.2.1.1.-1 and 4.7.2.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.2.1.1-2 and 4.7.2.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.2.1.1-3 and 4.7.2.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.2.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-RSRQ Accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrp | false |  |  |
| sinr | false |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.2.2.1.5 Test requirement

Table 4.7.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.1.5-2

Table 4.7.2.2.1.5-1: SS-RSRQ Inter frequency test parameters

| Parameter | | | | Unit | Test 1 | | Test 2 | | Test 3 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 | |
| SSB ARFCN | | | |  | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 | |
| Duplex mode | | Config 1,4 | |  | FDD | | | | | | |
| Config 2,3,5,6 | | TDD | | | | | | |
| TDD configuration | | Config 1,4 | |  | Not Applicable | | | | | | |
| Config 2,5 | | TDDConf.1.1 | | | | | | |
| Config 3,6 | | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1,4 | | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2,5 | | 10: NRB,c = 52 | | | | | | |
| Config 3,6 | | 40: NRB,c = 106 | | | | | | |
| Gap pattern ID | | Config 1-6 | |  | 0 | | | | | | |
| BWP configuration | | Initial DL BWP | |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP | |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP | | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP | | ULBWP.1.1 | | | | | | |
| DRX Cycle | | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 | |  | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - | |
| Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| Config 3,6 | | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1,4 | |  | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD |  | |
| Config 2,5 | |  | CR.1.1 TDD |  | CR.1.1 TDD |  | CR.1.1 TDD |  | |
| Config 3,6 | |  | CR2.1 TDD |  | CR2.1 TDD |  | CR2.1 TDD |  | |
| Dedicated CORESET Reference Channel | | Config 1,4 | |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
| Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| Config 3,6 | | CCR2.1 TDD | CCR2.1 TDD | CCR2.1 TDD |
| TRS configuration | | Config 1,4 | |  | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD | TRS.1.1 TDD |
| Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | | | |  | OP.1 | | | | | | |
| SMTC configuration | | Config 2,3,5,6 | |  | SMTC.1 | | | | | | |
| Config 1,4 | | SMTC.2 | | | | | | |
| Time offset between Cell 2 and Cell 3 | | Config 2,3,5,6 | | μs | 3 | | | | | | |
| Config 1,4 | | ms | 3 | | | | | | |
| SSB configuration | | Config 1,2,4,5 | |  | SSB.1 in FR1 | | | | | | |
| Config 3,6 | | SSB.2 in FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | | kHz | 15 kHz | | | | | | |
| Config 3,6 | | 30 kHz | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | Config 1,2,4,5 | | Depending on band group | dBm/15kHz | -81.68 | -81.68 | -106 | -106 | -116 + ΔBG\_offset | -116 + ΔBG\_offset | |
| Note2 | Config 3,6 | | Depending on band group | dBm/15kHz | -87.80 | -87.80 | -113 | -113 | -116+ ΔBG\_offset | -116+ ΔBG\_offset | |
| Note2 | Config 1,2,4,5 | | Depending on band group | dBm/SCS | -81.68 | -81.68 | -106 | -106 | -116 + ΔBG\_offset | -116 + ΔBG\_offset | |
| Config 3,6 | | Depending on band group | -84.8 | -84.8 | -110 | -110 | -113+ ΔBG\_offset | -113+ ΔBG\_offset | |
|  | | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 | |
|  | | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 | |
| SS-RSRPNote3 | Config 1,2,4,5 | | Depending on band group | dBm/SCS | -83.43 | -83.43 | -107.75 | -107.75 | -113+ ΔBG\_offset | -117.75+ ΔBG\_offset | |
| Config 3,6 | | Depending on band group | -86.54 | -86.54 | -111.75 | -111.75 | -110+ ΔBG\_offset | -114.75+ ΔBG\_offset | |
| SS-RSRQNote3 | | |  | dB | -14.76 | -14.76 | -14.76 | -14.76 | -12.56 | -14.76 | |
| IoNote3 | Config 1,2,4,5 | | Depending on band group | dBm/Ch BW | -51.51 | -51.51 | -75.83 | -75.83 | -83.28+ ΔBG\_offset | -85.83+ ΔBG\_offset | |
| Config 3,6 | | Depending on band group | -51.52 | -51.52 | -76.73 | -76.73 | -77.19+ ΔBG\_offset | -79.73+ ΔBG\_offset | |
| Propagation condition | | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN | |
| Antenna configuration | | | |  | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2.  NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | | | |

Table 4.7.2.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ\_52 | SS-RSRQ\_52 | SS-RSRQ\_52 |
| Highest reported value (Cell 3) | SS-RSRQ\_62 | SS-RSRQ\_62 | SS-RSRQ\_62 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ\_49 | SS-RSRQ\_49 | SS-RSRQ\_49 |
| Highest reported value (Cell 3) | SS-RSRQ\_65 | SS-RSRQ\_65 | SS-RSRQ\_65 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

##### 4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy

4.7.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands.

4.7.2.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.2.

4.7.2.2.2.4 Test description

4.7.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.2.4.1-1.

Table 4.7.2.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported  
test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.2.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.2.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.2.4.1-2.

Table 4.7.2.2.2.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.2.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.2.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.2.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the SS-RSRQ value of Cell 2 reported by the UE. If the difference between both values is outside the limits in Table 4.7.2.2.2.5-2 or the UE fails to report the measurement value for Cell 3 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.2.2.2.5-1 as appropriate and repeat steps 5-7.

4.7.2.2.2.4.3 Message contents

Message contents are same as in clause 4.7.2.2.1.4.3.

4.7.2.2.2.5 Test requirement

Table 4.7.2.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.2.5-2.

**Table 4.7.2.2.2.5-1: same as Table 4.7.2.2.2.1.5-1**

Table 4.7.2.2.2.5-2: SS-RSRQ Inter frequency relative accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | |  |
| Lowest reported value (Cell 3) | SS-RSRQ\_x - 7 | SS-RSRQ\_x - 7 | SS-RSRQ\_x - 11 |
| Highest reported value (Cell 3) | SS-RSRQ\_x + 7 | SS-RSRQ\_x + 7 | SS-RSRQ\_x + 2 |
| Extreme Conditions | | |  |
| Lowest reported value (Cell 3) | SS-RSRQ\_x - 9 | SS-RSRQ\_x - 9 | SS-RSRQ\_x - 13 |
| Highest reported value (Cell 3) | SS-RSRQ\_x + 9 | SS-RSRQ\_x + 9 | SS-RSRQ\_x + 4 |
| RSRQ\_x is the reported value of Cell 2 | | |  |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.3 SS-SINR

#### 4.7.3.0 Minimum conformance requirements

##### 4.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

The intra-frequency SS-SINR accuracy requirements are defined for the SS-SINR measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to clause B.2.2 for a corresponding Band.

Table 4.7.3.0.1-1: SS-SINR Intra frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 3 | Io Note 1 range | | | | |
| NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| ±3.0 | ±4 | ≥-3 dB | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.  NOTE 4: NR operating band groups in FR1 are as defined in Section 3A.4.1. | | | | | | | |

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.3.0.1-2: SS-SINR and CSI-RSRP measurement report mapping

|  |  |  |  |
| --- | --- | --- | --- |
| Reported value | Measured quantity value (L3 SS-SINR) | Measured quantity value (L1 SS-SINR and L1 CSI-SINR) | Unit |
| SINR\_0 | SS-SINR<-23 | SINR<-23 | dB |
| SINR\_1 | -23≤ SS-SINR<-22.5 | -23≤SINR<-22.5 | dB |
| SINR\_2 | -22.5≤ SS-SINR<-22 | -22.5≤SINR<-22 | dB |
| SINR\_3 | -22≤ SS-SINR<-21.5 | -22≤SINR<-21.5 | dB |
| SINR\_4 | -21.5≤ SS-SINR<-21 | -21.5≤SINR<-21 | dB |
| .. | .. | .. | … |
| SINR\_123 | 38≤ SS-SINR<38.5 | 38≤SINR<38.5 | dB |
| SINR\_124 | 38.5≤ SS-SINR<39 | 38.5≤SINR<39 | dB |
| SINR\_125 | 39≤ SS-SINR<39.5 | 39≤SINR<39.5 | dB |
| SINR\_126 | 39.5≤ SS-SINR<40 | 39.5≤SINR<40 | dB |
| SINR\_127 | 40≤ SS-SINR | 40≤SINR | dB |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.12.1.1 and 10.1.16.

##### 4.7.3.0.2 Inter-frequency absolute SS-SINR measurement accuracy requirements

The intra-frequency SS-SINR accuracy requirements are defined for the SS-SINR measured from a cell on a different carrier frequency than that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.3.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

Table 4.7.3.0.2-1: SS-SINR Inter frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 3 | Io Note 1 range | | | | |
| NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| ±3.0 | ±4 | ≥-3 dB | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1.1 and 10.1.16.

##### 4.7.3.0.3 Inter-frequency relative SS-SINR measurement accuracy requirements

The inter-frequency SS-SINR relative accuracy requirements in this clause are defined for the SS-SINR measured from one cell on a frequency in FR1compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.3.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

- |SSB\_RP1dBm - SSB\_RP2dBm| ≤ 27 dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

Table 4.7.3.0.3-1: SS-SINR Inter frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2,4 | Io Note 1 range | | | | |
| NR operating band groups Note 5 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
| SCSSSB = 120 kHz | SCSSSB = 240 kHz |
| ±3.5 | ±4 | ≥-3 dB | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 dB | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 4: The requirements apply for SSB Ês/Iot ≤ [25] dB.  NOTE 5: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1.2 and 10.1.16.

#### 4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy

4.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

4.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

4.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.1.

4.7.3.1.4 Test description

4.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.1.4.1-1.

Table 4.7.3.1.4.1-1: EN-DC FR1 SS-SINR measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.3.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.3.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.1.4.1-2.

Table 4.7.3.1.4.1-2: Initial conditions for SS-SINR intra frequency accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |  |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.3.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 4.7.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.3.1.5-1 as appropriate and repeat steps 5-7.

4.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.3.1.4.3-1: Common Exception messages for EN-DC FR1 SS-SINR measurement accuracy

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-5  Table H.3.1-7  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.7.3.1-1 and 4.7.3.1-4 | Table H.3.1-3 with Condition and SS-SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.3.1-2 and 4.7.3.1-5 | Table H.3.1-3 with Condition Synchronous cells and SS-SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.3.1-3 and 4.7.3.1-6 | Table H.3.1-3 with Condition Synchronous cells and SS-SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-SINR Accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrp | false |  |  |
| rsrq | false |  |  |
| sinr | true |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.3.1.5 Test requirements

Table 4.7.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.3.1.5-2

Table 4.7.3.1.5-1: SS-SINR Intra frequency test parameters

| Parameter | | | | Unit | Test 1 | | | Test 2 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cell 2 | Cell 3 | | Cell 2 | | | Cell 3 |
| SSB ARFCN | | | |  | freq1 | | | freq1 | | | |
| Duplex mode | | | Config 1,4 |  | FDD | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | |
| TDD configuration | | | Config 1,4 |  | Not Applicable | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | |
| Downlink initial BWP configuration | | | |  | DLBWP.0.1 | | | | | | |
| Downlink dedicated BWP configuration | | | |  | DLBWP.1.1 | | | | | | |
| Uplink initial BWP configuration | | | |  | ULBWP.0.1 | | | | | | |
| Uplink dedicated BWP configuration | | | |  | ULBWP.1.1 | | | | | | |
| DRX Cycle configuration | | | | ms | Not Applicable | | | | | | |
| TRS configuration | | | Config 1,4 |  | TRS.1.1 FDD |  | | TRS.1.1 FDD | | |  |
| Config 2,5 |  | TRS.1.1 TDD | - | | TRS.1.1 TDD | | | - |
| Config 3,6 |  | TRS.1.2 TDD |  | | TRS.1.2 TDD | | |  |
| PDSCH Reference measurement channel | | | Config 1,4 |  | SR.1.1 FDD | - | | SR.1.1 FDD | | | - |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | SR2.1 TDD | | |
| RMSI CORESET Reference Channel | | | Config 1,4 |  | CR.1.1 FDD | - | | CR.1.1 FDD | | |  |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | | | Config 1,4 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | | | - |
| Config 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | | |
| Config 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | | |
| OCNG Patterns | | | |  | OP.1 | | | | | | |
| SS-RSSI-Measurement | | | |  | Not Applicable | | | | | | |
| Time offset with Cell 2 | | | Config 2,3,5,6 | μs | - | | 3 | | - | 3 | |
| Config 1,4 | ms | - | | 3 | | - | 3 | |
| SMTC configuration | | | Config 1,4 |  | SMTC.2 | | | | | | |
| Config 2,3,5,6 |  | SMTC.1 | | | | | | |
| SSB configuration | | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2,4,5 | kHz | 15 | | | | | | |
| Config 3,6 | 30 | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | | 0 | | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | | | Depending on band group | dBm/15kHz | -93 | | | -116+ ΔBG\_offset | | | |
| Note2 | Config 1,2,4,5 | | | dBm/SCS | -93.2 | | | Same as Noc for 15kHz | | | |
| Config 3,6 | | Depending on band group | -90.2 | | | -113+ ΔBG\_offset | | | |
|  | | | | dB | 0 | -3.19 | | -5.46 | | | -5.46 |
|  | | | | dB | 4.54 | 2.66 | | -3.5 | | | -3.5 |
| SS-RSRPNote3 | Config 1,2,4,5 | | Depending on band group | dBm/SCS | -88.46 | -90.34 | | -119.5+ ΔBG\_offset | | | -119.5+ ΔBG\_offset |
| Config 3,6 | | Depending on band group | -85.65 | -87.53 | | -116.5+ ΔBG\_offset | | | -116.5+ ΔBG\_offset |
| SS-SINR Note3 | | |  | dB | 0 | -3.19 | | -5.1 | | | -5.1 |
| IoNote3 | | Config 1,2,4,5 | Depending on band group | dBm/  9.36MHz | -57.5 | | | -85.28+ ΔBG\_offset | | | |
| Config 3,6 | Depending on band group | dBm/  38.16MHz | -51.59 | | | -79.17+ ΔBG\_offset | | | |
| Propagation condition | | | | - | AWGN | | | | | | |
| Antenna configuration | | | | - | 1x2 | | | | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2  NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | |

Table 4.7.3.1.5-2: SS-SINR Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR\_31 | SS-SINR\_28 |
| Highest reported value (Cell 3) | SS-SINR\_49 | SS-SINR\_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR\_30 | SS-SINR\_27 |
| Highest reported value (Cell 3) | SS-SINR\_50 | SS-SINR\_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.3.2 Inter-Frequency SS-SINR measurement accuracy

##### 4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy

4.7.3.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands.

4.7.3.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

4.7.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.2.1.

4.7.3.2.1.4 Test description

4.7.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.2.1.4.1-1.

Table 4.7.3.2.1.4.1-1: EN-DC FR1-FR1 SS-SINR measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.3.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.3.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.2.1.4.1-2.

Table 4.7.3.2.1.4.1-2: Initial conditions for SS-SINR inter frequency accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.3.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.3.2.1.4.2 Test procedure

Same as in clause 4.7.3.1.4.2 but replacing Table 4.7.3.1.5-1 and 4.7.3.1.5-2 with 4.7.3.2.1.5-1 and 4.7.3.2.1.5-2, respectively.

4.7.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.3.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-SINR  
absolute measurement accuracy

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with condition INTER-FREQ  Table H.3.1-5  Table H.3.1-7 with condition INTER-FREQ  Table H.3.4-1  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-4 with Condition gapUE  Table H.3.4-5 with Condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.7.3.1.1.-1 and 4.7.3.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO and SS-SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.3.1.1-2 and 4.7.3.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and SS-SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.3.1.1-3 and 4.7.3.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and SS-SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.3.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-SINR Accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrp | false |  |  |
| rsrq | false |  |  |
| sinr | true |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.3.2.1.5 Test requirements

Table 4.7.3.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.3.2.1.5-2.

Table 4.7.3.2.1.5-1: SS-SINR Inter frequency test parameters

| Parameter | | | Unit | Test 1 | | | Test 2 | | | | Test 3 | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cell 2 | Cell 3 | | Cell 2 | | Cell 3 | | Cell 2 | | Cell 3 | | |
| SSB ARFCN | | |  | freq1 | freq2 | | freq1 | | freq2 | | freq1 | | freq2 | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | | | | | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | | | | | | | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | | | | | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | | | | | | | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | | | | | | | |
| Gap pattern ID | | |  | 0 | | - | | 0 | | - | | 0 | | | - |
| TRS configuration | | Config 1, 4 |  | TRS.1.1 FDD | |  | | TRS.1.1 FDD | |  | | TRS.1.1 FDD | | |  |
| Config 2, 5 |  | TRS.1.1 TDD | | - | | TRS.1.1 TDD | | - | | TRS.1.1 TDD | | | - |
| Config 3, 6 |  | TRS.1.2 TDD | |  | | TRS.1.2 TDD | |  | | TRS.1.2 TDD | | |  |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | | SR.1.1 FDD | | - | | SR.1.1 FDD | | - | | |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD | | SR.1.1 TDD | |
| Config 3,6 | SR.2.1 TDD | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | | CR.1.1 FDD | | - | | CR.1.1 FDD | | - | | |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD | | CR.1.1 TDD | |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1,4 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | | - | | CCR.1.1 FDD | | - | | |
| Config 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | | CCR.1.1 TDD | |
| Config 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | |  | OP.1 | | | | | | | | | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | | | | | | | | | |
| Time offset with Cell 2 | | Config 2,3,5,6 | μs | - | | 3 | | - | | 3 | | - | | | 3 |
| Config 1,4 | ms | - | | 3 | | - | | 3 | | - | | | 3 |
| STMC configuration | | Config 2,3,5,6 |  | SMTC.1 | | | | | | | | | | | |
|  | | Config 1,4 |  | SMTC.2 | | | | | | | | | | | |
| SSB configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | | | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | | | | | | | | | |
| Config 3,6 | 30 | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | | 0 | | 0 | | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -88 | -88 | | -108.5 | | -108.5 | | -119.5+ ΔBG\_offset | | | -119.5+ ΔBG\_offset | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -88 | -88 | | -108.5 | | -108.5 | | Same as Noc for 15kHz | | | Same as Noc for 15kHz | |
| Config 3,6 | Depending on band group | -85 | -85 | | -105.5 | | -105.5 | | -116.5+ ΔBG\_offset | | | 116.5+ ΔBG\_offset | |
|  | | | dB | -1.75 | -1.75 | | 20 | | 20 | | -3.2 | | | -3.2 | |
|  | | | dB | -1.75 | -1.75 | | 20 | | 20 | | -3.2 | | | -3.2 | |
| SS-RSRPNote3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -89.75 | -89.75 | | -88.5 | | -88.5 | | -122.7+ ΔBG\_offset | | | -122.7+ ΔBG\_offset | |
| Config 3,6 | Depending on band group | -86.75 | -86.75 | | -85.5 | | -85.5 | | -119.7+ ΔBG\_offset | | | -119.7+ ΔBG\_offset | |
| SS-SINR Note3 | |  | dB | -1.75 | -1.75 | | 20 | | 20 | | -3.2 | | | -3.2 | |
| IoNote3 | Config 1,2,4,5 | Depending on band group | dBm/  9.36MHz | -57.83 | -57.83 | | -60.5 | | -60.5 | | -89.85+ ΔBG\_offset | | | -89.85+ ΔBG\_offset | |
| Config 3,6 | Depending on band group | dBm/  38.16MHz | -51.73 | -51.73 | | -54.41 | | -54.41 | | -83.75+ ΔBG\_offset | | | -83.75+ ΔBG\_offset | |
| Propagation condition | | | - | AWGN | | | | | | | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | | | | | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2.  NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | | | | | | | |

Table 4.7.3.2.1.5-2: SS-SINR Inter frequency absolute accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR\_35 | SS-SINR\_79 | SS-SINR\_32 |
| Highest reported value (Cell 3) | SS-SINR\_51 | SS-SINR\_94 | SS-SINR\_49 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR\_33 | SS-SINR\_77 | SS-SINR\_31 |
| Highest reported value (Cell 3) | SS-SINR\_53 | SS-SINR\_96 | SS-SINR\_50 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

##### 4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy

4.7.3.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands.

4.7.3.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

4.7.3.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.2.2.

4.7.3.2.2.4 Test description

4.7.3.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.2.2.4.1-1.

Table 4.7.3.2.2.4.1-1: EN-DC FR1-FR1 SS-SINR measurement accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.3.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.3.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.2.2.4.1-2.

Table 4.7.3.2.2.4.1-2: Initial conditions for SS-SINR inter frequency accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.3.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.3.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.3.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.3.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the SS-SINR value of Cell 2 reported by the UE. If the difference between both values is outside the limits in Table 4.7.3.2.2.5-2 or the UE fails to report the measurement value for Cell 3 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.3.2.2.5-1 as appropriate and repeat steps 5-7.

4.7.3.2.2.4.3 Message contents

Message contents are same as in clause 4.7.3.2.1.4.3.

4.7.3.2.2.5 Test requirements

Table 4.7.3.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.3.2.2.5-2

**Table 4.7.3.2.2.2.5-1: same as Table 4.7.3.2.2.1.5-1**

Table 4.7.3.2.2.5-2: SS-SINR Inter frequency relative accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | |  |
| Lowest reported value (Cell 3) | SS-SINR\_x - 10 | SS-SINR\_x - 10 | SS-SINR\_x - 11 |
| Highest reported value (Cell 3) | SS-SINR\_x + 10 | SS-SINR\_x + 10 | SS-SINR\_x + 11 |
| Extreme Conditions | | |  |
| Lowest reported value (Cell 3) | SS-SINR\_x - 12 | SS-SINR\_x - 12 | SS-SINR\_x - 12 |
| Highest reported value (Cell 3) | SS-SINR\_x + 12 | SS-SINR\_x + 12 | SS-SINR\_x + 12 |
| RSRQ\_x is the reported value of Cell 2 | | |  |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.4 L1-RSRP

#### 4.7.4.0 Minimum conformance requirements

##### 4.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 4.7.4.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.

Table 4.7.4.0.1-1: SSB based L1-RSRP absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -121 | -118 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -70 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | N/A | -70 |
| ±5.0 | ±9.5 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A, NR\_FDD\_FR1\_B, NR\_TDD\_FR1\_C, NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D, NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E, NR\_FDD\_FR1\_F, NR\_FDD\_FR1\_G, NR\_FDD\_FR1\_H, | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4. | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.4.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping

|  |  |  |  |
| --- | --- | --- | --- |
| Reported value | Measured quantity value (L3 SS-RSRP and CSI-RSRP) | Measured quantity value (L1 SS-RSRP and CSI-RSRP) | Unit |
| RSRP\_0 | RSRP<-156 | Not valid | dBm |
| RSRP\_1 | -156≤RSRP<-155 | Not valid | dBm |
| RSRP\_2 | -155≤RSRP<-154 | Not valid | dBm |
| RSRP\_3 | -154≤RSRP<-153 | Not valid | dBm |
| RSRP\_4 | -153≤RSRP<-152 | Not valid | dBm |
| RSRP\_5 | -152≤RSRP<-151 | Not valid | dBm |
| RSRP\_6 | -151≤RSRP<-150 | Not valid | dBm |
| RSRP\_7 | -150≤RSRP<-149 | Not valid | dBm |
| RSRP\_8 | -149≤RSRP<-148 | Not valid | dBm |
| RSRP\_9 | -148≤RSRP<-147 | Not valid | dBm |
| RSRP\_10 | -147≤RSRP<-146 | Not valid | dBm |
| RSRP\_11 | -146≤RSRP<-145 | Not valid | dBm |
| RSRP\_12 | -145≤RSRP<-144 | Not valid | dBm |
| RSRP\_13 | -144≤RSRP<-143 | Not valid | dBm |
| RSRP\_14 | -143≤RSRP<-142 | Not valid | dBm |
| RSRP\_15 | -142≤RSRP<-141 | Not valid | dBm |
| RSRP\_16 | -141≤RSRP<-140 | RSRP<-140 | dBm |
| RSRP\_17 | -140≤RSRP<-139 | -140≤RSRP<-139 | dBm |
| RSRP\_18 | -139≤RSRP<-138 | -139≤ RSRP<-138 | dBm |
| … | … |  | … |
| RSRP\_111 | -46≤RSRP<-45 | -46≤ RSRP<-45 | dBm |
| RSRP\_112 | -45≤RSRP<-44 | -45≤ RSRP<-44 | dBm |
| RSRP\_113 | -44≤RSRP<-43 | -44≤ RSRP | dBm |
| RSRP\_114 | -43≤RSRP<-42 | Not valid | dBm |
| RSRP\_115 | -42≤RSRP<-41 | Not valid | dBm |
| RSRP\_116 | -41≤RSRP<-40 | Not valid | dBm |
| RSRP\_117 | -40≤RSRP<-39 | Not valid | dBm |
| RSRP\_118 | -39≤RSRP<-38 | Not valid | dBm |
| RSRP\_119 | -38≤RSRP<-37 | Not valid | dBm |
| RSRP\_120 | -37≤RSRP<-36 | Not valid | dBm |
| RSRP\_121 | -36≤RSRP<-35 | Not valid | dBm |
| RSRP\_122 | -35≤RSRP<-34 | Not valid | dBm |
| RSRP\_123 | -34≤ RSRP<-33 | Not valid | dBm |
| RSRP\_124 | -33≤RSRP<-32 | Not valid | dBm |
| RSRP\_125 | -32≤RSRP<-31 | Not valid | dBm |
| RSRP\_126 | -31≤RSRP | Not valid | dBm |
| RSRP\_127 (Note) | Infinity | Infinity | dBm |
| Note: The value of RSRP\_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.1.1 and 10.1.6.

4.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 4.7.4.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.

Table 4.7.4.0.2-1: SSB based L1-RSRP relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| ±3 | ±4 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.  NOTE 3: Void  NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4. | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.1.2 and 10.1.6.

##### 4.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 4.7.4.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.4.0.3-1.

Table 4.7.4.0.3-1: CSI-RS based L1-RSRP absolute accuracy in FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range | | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -70 |
| ±5.0 | ±9.5 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B, NR\_TDD\_FR1\_C, NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D, NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E, NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G, NR\_FDD\_FR1\_H | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4. | | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.2.1 and 10.1.6.

##### 4.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 4.7.4.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.4.0.4-1.

Table 4.7.4.0.4-1: CSI-RS based L1-RSRP relative accuracy in FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | Io Note 1 range | | | | | |
|  |  |  | NR operating band groups Note 4 | Minimum Io | | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±3 | ±4 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.  NOTE 3: Void  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.2.2 and 10.1.6.

#### 4.7.4.1 SSB based L1-RSRP measurements

##### 4.7.4.1.1 EN-DC FR1 SSB-based L1-RSRP absolute measurement accuracy

4.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.4.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

4.7.4.1.1.4 Test description

4.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.1.4.1-1.

Table 4.7.4.1.1.4.1-1: EN-DC FR1 SSB based L1-RSRP absolute measurement  
accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.4.1.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.1.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.1.4.1-2.

Table 4.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.4.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.1.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.1.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.1.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 4.7.4.1.1.5-2 or Table 4.7.4.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.1.1.5-1 as appropriate and repeat steps 3-5.

4.7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.4.1.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with conditions SSB and PERIODIC  Table H.3.4-1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1  Table H.3.5-8 |

Table 4.7.4.1.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.4.1.1.5 Test requirement

Table 4.7.4.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.4.1.1.5-3 for test configurations 3 and 6.

Table 4.7.4.1.1.5-1: L1-RSRP test parameters

| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| --- | --- | --- | --- | --- | --- |
| SSB GSCN | | 1~6 |  | freq1 | freq1 |
| Duplex mode | | 1,4 |  | FDD | FDD |
| 2,5 | TDD | TDD |
| 3,6 | TDD | TDD |
| TDD Configuration | | 1,4 |  | N/A | N/A |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.3 FR1 | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2,5 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3,6 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~6 |  | periodic | periodic |
| reportQuantity | | 1~6 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1~6 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~6 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -96.00 | 117+ ΔBG\_offset |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -93.00 | -114+ ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + ΔBG\_offset |
| 3,6 | -83.00 | -116.2 + ΔBG\_offset |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + ΔBG\_offset |
| 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 |  | AWGN | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 | 1x2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

Table 4.7.4.1.1.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 62 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 31 |
| Bands NR\_FDD\_FR1\_B | 31 |
| Bands NR\_TDD\_FR1\_C | 32 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 32 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 33 |
| Bands NR\_FDD\_FR1\_G | 34 |
| Bands NR\_FDD\_FR1\_H | 34 |
| Highest reported value (Cell 2) | 82 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 44 |
| Bands NR\_FDD\_FR1\_B | 45 |
| Bands NR\_TDD\_FR1\_C | 45 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 46 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 46 |
| Bands NR\_FDD\_FR1\_G | 47 |
| Bands NR\_FDD\_FR1\_H | 48 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 61 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 30 |
| Bands NR\_FDD\_FR1\_B | 30 |
| Bands NR\_TDD\_FR1\_C | 31 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 31 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 32 |
| Bands NR\_FDD\_FR1\_G | 33 |
| Bands NR\_FDD\_FR1\_H | 33 |
| Highest reported value (Cell 2) | 83 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 45 |
| Bands NR\_FDD\_FR1\_B | 46 |
| Bands NR\_TDD\_FR1\_C | 46 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 47 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 47 |
| Bands NR\_FDD\_FR1\_G | 48 |
| Bands NR\_FDD\_FR1\_H | 49 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

Table 4.7.4.1.1.5-3: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 63 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 34 |
| Bands NR\_FDD\_FR1\_B | 34 |
| Bands NR\_TDD\_FR1\_C | 35 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 35 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 36 |
| Bands NR\_FDD\_FR1\_G | 37 |
| Bands NR\_FDD\_FR1\_H | 37 |
| Highest reported value (Cell 2) | 84 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 47 |
| Bands NR\_FDD\_FR1\_B | 48 |
| Bands NR\_TDD\_FR1\_C | 48 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 49 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 49 |
| Bands NR\_FDD\_FR1\_G | 50 |
| Bands NR\_FDD\_FR1\_H | 51 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 62 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 33 |
| Bands NR\_FDD\_FR1\_B | 33 |
| Bands NR\_TDD\_FR1\_C | 34 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 34 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 35 |
| Bands NR\_FDD\_FR1\_G | 36 |
| Bands NR\_FDD\_FR1\_H | 36 |
| Highest reported value (Cell 2) | 85 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 48 |
| Bands NR\_FDD\_FR1\_B | 49 |
| Bands NR\_TDD\_FR1\_C | 49 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 50 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 50 |
| Bands NR\_FDD\_FR1\_G | 51 |
| Bands NR\_FDD\_FR1\_H | 52 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

##### 4.7.4.1.2 EN-DC FR1 SSB-based L1-RSRP relative measurement accuracy

4.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.4.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

4.7.4.1.2.4 Test description

4.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.2.4.1-1.

Table 4.7.4.1.2.4.1-1: EN-DC FR1 SSB based L1-RSRP relative measurement  
accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.4.1.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.1.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.2.4.1-2.

Table 4.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.4.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.1.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.1.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.1.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 4.7.4.1.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.1.2.5-1 as appropriate and repeat steps 3-5.

4.7.4.1.2.4.3 Message contents

Message contents are same as in Clause 4.7.4.1.1.4.3.

4.7.4.1.2.5 Test requirement

Table 4.7.4.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.4.1.2.5-2.

Table 4.7.4.1.2.5-1: Same as Table 4.7.4.1.1.5-1

Table 4.7.4.1.2.5-2: L1-RSRP relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | +3 | --3 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | +4 | +4 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.4.2 CSI-RS based L1-RSRP measurements

##### 4.7.4.2.1 EN-DC FR1 CSI-RS-based L1-RSRP absolute measurement accuracy

4.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.4.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

4.7.4.2.1.4 Test description

4.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.1.4.1-1.

Table 4.7.4.2.1.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP absolute measurement  
accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.4.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.1.4.1-2.

Table 4.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1

| Parameter | Value | | Comment |
| --- | --- | --- | --- |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.4.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.2.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.2.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.2.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS #0 or CSI-RS #1 in the periodic L1-RSRP reports. If the value for the strongest CSI-RS is within the limits in Table 4.7.4.2.1.5-2 or Table 4.7.4.2.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

4.7.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.4.2.1.4.3-1: Common Exception messages EN-DC CSI-RS-based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and CSI-RSRP  Table H.3.6-3 with conditions CSI-RS and PERIODIC  Table H.3.4-1  Table H.3.5-8  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.4.2.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSB. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

4.7.4.2.1.5 Test requirement

Table 4.7.4.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.2.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.4.2.1.5-3 for test configurations 3 and 6.

Table 4.7.4.2.1.5-1: L1-RSRP test parameters

| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| --- | --- | --- | --- | --- | --- |
| SSB GSCN | | 1~6 |  | freq1 | freq1 |
| Duplex mode | | 1,4 |  | FDD | FDD |
| 2,5 | TDD | TDD |
| 3,6 | TDD | TDD |
| TDD Configuration | | 1,4 |  | N/A | N/A |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.3 FR1 | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2,5 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3,6 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 |
| CSI-RS | | 1,4 |  | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD | |
| 2,5 | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD | |
| 3,6 | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD | |
| reportConfigType | | 1~6 |  | periodic | periodic |
| reportQuantity | | 1~6 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | | 1~6 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~6 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -96.00 | 117+ ΔBG\_offset |
| Note2 | 1,2,4,5 | dBm/CSI-RS SCS | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -93.00 | -114+ ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| CSI-RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/CSI-RS SCS | -84.65 | -119.2 + ΔBG\_offset |
| 3,6 | -83.00 | -116.2 + ΔBG\_offset |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + ΔBG\_offset |
| 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 |  | AWGN | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 | 1x2 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

Table 4.7.4.2.1.5-2: Same as Table 4.7.4.1.1.5-2

Table 4.7.4.2.1.5-3: Same as Table 4.7.4.1.1.5-3

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

##### 4.7.4.2.2 EN-DC FR1 CSI-RS-based L1-RSRP relative measurement accuracy

4.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.4.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

4.7.4.2.2.4 Test description

4.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.2.4.1-1.

Table 4.7.4.2.2.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP relative measurement  
accuracy supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.4.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.2.4.1-2.

Table 4.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.4.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.2.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.2.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.2.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.2.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-RSRP reports. The DIFF-RSRP value of CSI-RS#0 or CSI-RS#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 4.7.4.2.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.2.5-1 as appropriate and repeat steps 3-5.

4.7.4.2.2.4.3 Message contents

Message contents are same as in Clause 4.7.4.2.1.4.3.

4.7.4.2.2.5 Test requirement

Table 4.7.4.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.2.2.5-2.

Table 4.7.4.2.2.5-1: Same as Table 4.7.4.2.1.5-1

Table 4.7.4.2.2.5-2: Same as Table 4.7.4.1.2.5-2

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.5 SFTD

#### 4.7.5.0 Minimum conformance requirements

##### 4.7.5.0.1 SFTD Accuracy Requirement

The SFN and frame timing difference (SFTD) is measured between PCell and NR PSCell under EN-DC, or between PCell and NR cell for inter-RAT SFTD. The inter-RAT SFTD measurement can only be configured for E-UTRA - NR band combinations that are supported by the UE.

The accuracy requirements in Table 4.7.5.0.1-3 are applicable under the following conditions:

For PCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.

- Conditions defined in TS 36.101 [27] clause 7.3 for reference sensitivity are fulfilled.

- No changes to the uplink transmission timing are applied during the measurement period.

- RSRP|dBm according to Annex B.3.5 of TS 36.133 [23] for a corresponding Band.

- Io range defined in Table 4.7.5.0.1-1.

Table 4.7.5.0.1-1: PCell Io range conditions for SFTD measurement accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Io Note 1 range | | |
| E-UTRA operating band groups Note 4, 5 | Minimum Io | Maximum Io |
|  | dBm/15kHz Note 2, 3 | dBm/BWChannel |
| Conditions | FDD\_A, TDD\_A | -121 | -50 |
| FDD\_C, TDD\_C | -120 | -50 |
| FDD\_D | -119.5 | -50 |
| FDD\_E, TDD\_E | -119 | -50 |
| FDD\_F | -118.5 | -50 |
| FDD\_G | -118 | -50 |
| FDD\_H | -117.5 | -50 |
| FDD\_N | -114.5 | -50 |
| NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.  NOTE 2: The condition level is increased by ∆>0, when applicable, as described in clause B.4.2 and B.4.3 of TS 36.133 [23].  NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.  NOTE 4: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].  NOTE 5: Only E-UTRA bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable. | | | |

For NR PSCell, or NR cell SFN and frame timing measurement in FR1:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.

- Io range defined in Table 4.7.5.0.1-2.

Table 4.7.5.0.1-2: NR PSCell, or NR cell Io range conditions for SFTD measurement accuracy in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Io Note 1 range | | | |
| NR operating band groups Note 4, 5 | Minimum Io Note 2, 3 | | Maximum Io |
|  | dBm/ SCSSSB | | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| Conditions | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | -121 | -118 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The condition level is increased by ΔRIB,c as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA - NR band combination.  NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.  NOTE 4: NR operating band groups are as defined in clause 3.5 of TS 36.133 [23].  NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable. | | | | |

Table 4.7.5.0.1-3: SFTD measurement accuracy

|  |  |  |
| --- | --- | --- |
| Accuracy | Conditions | |
| Ês/Iot | Frequency range |
| Ts Note 1 | dB |  |
| 40 | ≥ -3 dB | FR1 |
| 40 | FR2 |
| NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24].  NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies. | | |

#### 4.7.5.1 EN-DC FR1 SFTD measurement accuracy

4.7.5.1.1 Test purpose

The purpose of this test is to verify that SFTD measurement accuracy is within the specified limits for all bands.

4.7.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards. Applicability requires support of SFTD measurements between an E-UTRA PCell and an NR PSCell.

4.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.5.1.

4.7.5.1.4 Test description

4.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.5.1.4.1-1.

Table 4.7.5.1.4.1-1: Test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 4.7.5.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.5.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.5.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.5.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.5.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.5.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.5.1.4.1-2.

Table 4.7.5.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.5.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

3. The SFTD between PCell and PSCell shall be set to one of the conditions in Table 4.7.5.1.5-2. For negative Frame boundary offset, it can be achieved delaying PSCell in regards to PCell OR advancing PCell in regards to PSCell. For positive Frame boundary offset, it can be achieved delaying PCell in regards to PSCell OR advancing PSCell in regards to PCell.

4.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.5.1.5-1 and Table 4.7.5.1.5-2 as appropriate. (Condition = 3)

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit a MeasurementReport containing the MeasResultCellListSFTD-r15 for the PSCell with SFTD measurements.

6. The SS shall check the reported SFN offset and frame boundary offset between the E-UTRA PCell and the NR PSCell. The number of failed iterations is increased by one if

- The value of *sfn-OffsetResult* is different with the expected SFN offset value, or

- The value of *frameBoundaryOffsetResult* is outside the range given in Table 4.7.5.1.5-3, or

- The UE fails to report the measurement value for Cell 2.

Otherwise the number of successful iterations is increased by one.

7. Switch off and on the UE and ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.5.1.4.3-1: Common exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.4-4 with Condition INTER\_RAT, GAPLESS and SFTD  Table H.3.4-7 with Condition Inter-RAT and SFTD |
| Specific message contents exceptions for Test Configuration 4.7.5.1.-1, 4.7.5.1-2, 4.7.5.1-4 and 4.7.5.1-54 | Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.5.1-3 and 4.7.5.1-6 | Table H.3.4-6 with Condition S SB.2 FR1 and SMTC.1 |

Table 4.7.5.1.4.3-2: ReportConfigInterRAT-SFTD

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25], Table 4.6.6-8B | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT ::= SEQUENCE { |  |  |  |
| reportQuantityCellNR-r15 ::= SEQUENCE { |  |  |  |
| ss-rsrp | true |  |  |
| } |  |  |  |
| reportSFTD-Meas-r15 | pSCell |  |  |
| } |  |  |  |

4.7.5.1.5 Test requirement

Table 4.7.5.1.5-1 defines the primary level settings including test tolerances.

Table 4.7.5.1.5-1: Test parameters for SFTD accuracy

| Parameter | Config | Unit | Test 1 |
| --- | --- | --- | --- |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| RMC CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.1 FR1 |
| 2,5 | SSB.1 FR1 |
| 3,6 | SSB.2 FR1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DL BWP configuration | 1~6 |  | DLBWP.1.1 |
| UL BWP configuration | 1~6 |  | ULBWP.1.1 |
| CSI-RS for tracking | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1~6 | dBm/15kHz | -104 |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -104 |
| 3,6 | -101 |
|  | 1~6 | dB | -2.7 |
|  | 1~6 | dB | -2.7 |
| SS-RSRP Note3 | 1,2,4,5 | dBm/SCS | -106.7 |
| 3,6 | -103.7 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -74.18 |
| 3,6 | dBm/38.16 MHz | -68.08 |
| Propagation condition | 1~6 |  | AWGN |
| Antenna configuration | 1~6 |  | 1x2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | |

The SFTD reported by the UE consists of two elements, the SFN offset and the frame boundary offset between PCell and PSCell. Table 4.7.5.1.5-2 defines the timing offsets for the SFTD accuracy test. The SFN offset in reported SFTD shall match the values in Table 4.7.5.1.5-2 and the frame boundary offset in reported SFTD shall be within the range given in Table 4.7.5.1.5-3.

Table 4.7.5.1.5-2: Timing offsets for SFTD accuracy test

|  |  |  |
| --- | --- | --- |
| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

Table 4.7.5.1.5-3: EN-DC FR1 SFTD measurement accuracy requirements for the value of frameBoundaryOffsetResult in reported SFTD

| Normal and Extreme Conditions | frameBoundaryOffsetResult | | | | |
| --- | --- | --- | --- | --- | --- |
| Condition 1 | Condition 2 | Condition 3 | Condition 4 | Condition 5 |
| Lowest reported value | -24408 | -12116 | 192 | 12500 | 24792 |
| Highest reported value | -24392 | -12100 | 208 | 12516 | 24808 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.6 CLI measurements

#### 4.7.6.0 Minimum conformance requirements

##### 4.7.6.0.1 Minimum conformance requirements for SRS-RSRP accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 4.7.6.0.1-1 for FR1, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for SRS-RSRP measurements are fulfilled according to 38.133 [6] Annex B.2.7 for a corresponding Band for each relevant SRS resource configured for measurement.

- The time difference between UE’s DL reference timing in the serving cell and SRS arrival time is no larger than Terror\_SRS\_RSRP, where:

- Terror\_SRS\_RSRP = TC × NTA\_offset + 4.67us for FR1

- NTA\_offset is defined in 38.133 [6] Table 7.1.2-2

- TC is 0.509ns

- The number of SRS ports in the SRS resource configured for measurement is 1,

- The number of symbols in the SRS resource configured for measurement is 1,

- The number of repetitions in the SRS resource configured for measurement is 1,

- Frequency hopping, sequence group hopping, or sequence hopping is disabled in the SRS resource configured for measurement,

- The bandwidth of the SRS resource is 48 PRBs.

- One of the following conditions is met

- There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.

- If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

Table 4.7.6.0.1-1: SRS-RSRP absolute accuracy in FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | | | | | Conditions | | | | | | |
| Normal condition | | | Extreme condition | | | SRS Ês/Iot | Io Note 1 range | | | | | |
|  | | |  | | |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | | | | | | dB |  | dBm / SCSSRS | | | dBm/BW Channel | dBm/BW Channel |
| SCSSRS (kHz) | | | SCSSRS (kHz) | | |  |  |  | | |  |  |
| 15 | 30 | 60 | 15 | 30 | 60 |  |  | SCSSRS = 15 kHz | SCSSRS = 30 kHz | SCSSRS = 60 kHz |  |  |
| ±3 | ±3.5 | ±5 | ±7.5 | ±8 | ±9.5 | ≥1 | NR\_TDD\_FR1\_A, | -120 | -117 | -114 | N/A | -70 |
|  |  |  |  |  |  |  | NR\_TDD\_FR1\_C | -119 | -116 | -113 | N/A | -70 |
|  |  |  |  |  |  |  | NR\_TDD\_FR1\_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
|  |  |  |  |  |  |  | NR\_TDD\_FR1\_E | -118 | -115 | -112 | N/A | -70 |
| ±6.5 | ±7 | ±8.5 | ±9.5 | ±10 | ±11.5 | ≥1 | NR\_TDD\_FR1\_A,  NR\_TDD\_FR1\_C, NR\_TDD\_FR1\_D, NR\_TDD\_FR1\_E | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in 38.133 [6] clause 3.5.2. | | | | | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.1



###### 4.7.6.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 4.7.6.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.6.0.1.2-1: SRS-RSRP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| SRS-RSRP\_0 | SRS-RSRP<-140 | dBm |
| SRS-RSRP\_1 | -140≤ SRS-RSRP<-139 | dBm |
| SRS-RSRP\_2 | -139≤ SRS-RSRP<-138 | dBm |
| SRS-RSRP\_3 | -138≤ SRS-RSRP<-137 | dBm |
| SRS-RSRP\_4 | -137≤ SRS-RSRP<-136 | dBm |
| .. | .. | … |
| SRS-RSRP\_95 | -46≤ SRS-RSRP<-45 | dBm |
| SRS-RSRP\_96 | -45≤ SRS-RSRP<-44 | dBm |
| SRS-RSRP\_97 | -44≤ SRS-RSRP | dBm |
| SRS-RSRP\_98 | Infinity |  |
| Note: ‘Infinity’ means that UE cannot detect SRS due to too strong signal to measure. | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.2.

##### 4.7.6.0.2 Minimum conformance requirements for CLI-RSSI measurement accuracy with FR1 serving cell

The CLI-RSSI measurement reported by the UE shall fulfil the accuracy requirements defined in Table 4.7.6.0.2-1 for FR1, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

Table 4.7.6.0.2-1: CLI-RSSI absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | Io Note 1 range | | | | | |
|  |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB |  | dBm / SCSSRS | | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSSRS = 15 kHz | SCSSRS = 30 kHz | SCSSRS = 60 kHz |  |  |
| ±3.5 | ±6.5 | NR\_TDD\_FR1\_A, | -120 | -117 | -114 | N/A | -70 |
|  |  | NR\_TDD\_FR1\_C | -119 | -116 | -113 | N/A | -70 |
|  |  | NR\_TDD\_FR1\_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
|  |  | NR\_TDD\_FR1\_E | -118 | -115 | -112 | N/A | -70 |
| ±5.5 | ±8.5 | Note 3 | Note 3 | Note 3 | Note 3 | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in 38.133 [6] clause 3.5.2.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. | | | | | | | |



The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.2.1

4.7.6.0.2.1 CLI-RSSI report mapping

The reporting range of CLI-RSSI is defined from -100 dBm to -25 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 4.7.6.0.2.1-1. The range in the signalling may be larger than the guaranteed accuracy range. UE shall scale the measured CLI-RSSI to report a nominal RSSI equivalent to 6RB measurement with 15kHz SCS.

Table 4.7.6.0.2.1-1: CLI-RSSI measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CLI-RSSI\_00 | CLI-RSSI < ‑100 | dBm |
| CLI-RSSI\_01 | -100 ≤ CLI-RSSI < ‑99 | dBm |
| CLI-RSSI\_02 | -99 ≤ CLI-RSSI < ‑98 | dBm |
| … | … | … |
| CLI-RSSI\_74 | -27 ≤ CLI-RSSI < -26 | dBm |
| CLI-RSSI\_75 | -26 ≤ CLI-RSSI < -25 | dBm |
| CLI-RSSI\_76 | -25 ≤ CLI-RSSI | dBm |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.22.2.2.

#### 4.7.6.1 EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

4.7.6.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the SRS-RSRP measurement requirements in clause 4.7.6.0.

4.7.6.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting NR EN-DC and CLI-based SRS-RSRP measurements.

4.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.6.1.

4.7.6.1.4 Test description

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1) and NR FR1 PSCell (Cell 2). The test parameters for Cell 1 are defined in Annex A.6. The test parameters for the Cell 2 are given in Table 4.7.6.1.5-1 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table 4.7.6.1.5-2. The SRS resource configuration is given in Table 4.7.6.1.5-3.

4.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.6.1.4.1-1.

Table 4.7.6.1.4.1-1: Supported test configurations for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |
| --- | --- |
| Config | Description |
| 4.7.6.1-1 | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.7.6.1-2 | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.7.6.1-3 | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.7.6.1-4 | LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.6.1.4.1-2.

Table 4.7.6.1.4.1-2: Initial conditions for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |



1. Message contents are defined in clause 4.7.6.1.4.3.

2. Cell 1 is the E-UTRAN PCell, with power levels and settings set according to Annex A.6. Cell 2 is the NR serving cell (PSCell). The power levels and settings for Cell 2 are set according to Annex C.1.2 and C.1.3. Virtual UE 1 is the target for SRS-RSRP measurements.

3. The test parameters are given in Table 4.7.6.1.4.1-3

4.7.6.1.4.2 Test procedure

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 4.7.6.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to the corresponding Test in Table 4.7.6.1.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message, embedded in an *RRCConnectionReconfiguration* message, configuring a CLI measurement object with periodic reporting, as specified in section 4.7.6.1.4.3.

4. The UE shall transmit an *RRCReconfigurationComplete* message, embedded in an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically *MeasurementReport* messages, embedded in *ULInformationTransferMRDC* messages.

6. After 10s wait from Step 5, the SS shall check the SRS-RSRP reported values in the periodic *MeasurementReport*. The reported SRS-RSRP value of the neighbor virtual UE is compared to the expected SRS-RSRP as specified in Table 4.7.6.1.5-4 and Table 4.7.6.1.5-5 for Test 1 and Test 2, correspondingly. If the reported value is outside the limits specified in such tables, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each Test in Table 4.7.6.1.5-1 as appropriate and repeat steps 2-7.

4.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 4.7.6.1.4.3-1: Common Exception messages for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-5  Table H.3.4-1a  Table H.3.4-2  Table H.3.4-3 |

Table 4.7.6.1.4.3-2: *MeasObjectToAddModList* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 1 entry |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectCLI-r16 | MeasObjectCLI-r16 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.7.6.1.4.3-3: *MeasObjectCLI-r16* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectCLI-r16 ::= SEQUENCE { |  |  |  |
| cli-ResourceConfig-r16 SEQUENCE { |  |  |  |
| srs-ResourceConfig-r16 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| SRS-ResourceListConfigCLI-r16 SEQUENCE { | 1 entry |  |  |
| srs-Resource-r16 | SRSConf.1 | entry 1 | Config 1,3 |
|  | SRSConf.2 | entry 1 | Config 2,4 |
| srs-SCS-r16 | kHz15 |  | Config 1,3 |
|  | kHz30 |  | Config 2,4 |
| refServCellIndex-r16 | 0 | PSCell |  |
| refBWP-r16 | 0 | BWP-0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.7.6.1.4.3-4: *ReportConfigNR* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| cli-Periodical-r16 SEQUENCE { |  |  |  |
| reportInterval-r16 | ms240 |  |  |
| reportAmount-r16 | infinity |  |  |
| reportQuantityCLI-r16 | srs-rsrp |  |  |
| maxReportCLI-r16 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 4.7.6.1.4.3-5: *MeasResultCLI-r16* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 and TS 38.331 [13], clause 6.3.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultCLI-r16 ::= SEQUENCE { |  |  |  |
| measResultsListSRS-r16 CHOICE { |  |  |  |
| srs-ResourceId-r16 | SRS-ResourceId |  |  |
| srs-RSRP-Result-r16 | SRS-RSRP-Range-r16 | INTEGER (0..98) |  |
| } |  |  |  |
| } |  |  |  |

4.7.6.1.5 Test requirement

Table 4.7.6.1.5-1 and Table 4.7.6.1.5-2 define the primary level settings including test tolerances for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell. Table 4.7.6.1.5-3 defines the SRS resource configurations. Table 4.7.6.1.5-4 and Table 4.7.6.1.5-5 define the absolute accuracy requirements for Tests 1, 2 and 3 for configurations (1 and 3) and (2 and 4), correspondingly.

Table 4.7.6.1.5-1: NR Cell specific test parameters for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
| SSB GSCN | | 1~4 |  | freq1 | freq1 | freq1 |
| Duplex mode | | 1~4 |  | TDD | TDD | TDD |
| TDD configuration | | 1,3 |  | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
|  | | 2,4 |  | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,3 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 | 10: NRB,c = 52 |
|  | | 2,4 |  | 40: NRB,c = 106 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference | | 1,3 |  | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| measurement channel | | 2,4 |  | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference | | 1,3 |  | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD |
| Channel | | 2,4 |  | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET | | 1,3 |  | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| Reference Channel | | 2,4 |  | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,3 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | | 2,4 |  | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~4 |  | OP.1 | OP.1 | OP.1 |
| TRS configuration | | 1,3 |  | TRS.1.1 TDD | TRS.1.1 TDD | TRS.1.1 TDD |
|  | | 2,4 |  | TRS.1.2 TDD | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~4 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~4 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~4 |  | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | | 1~4 | μs | 17.67 | 17.67 | 17.67 |
| EPRE ratio of PSS to SSS | | 1~4 | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS | |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |  |  |  |
| Note2 | NR\_TDD\_FR1\_A Note3 | 1,3 | dBm/15kHz | -106 | -88 | -114 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -113 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -112.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -112 |
|  | NR\_TDD\_FR1\_A Note3 | 2,4 |  | Not applicableNote4 | -91 | -114 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -113 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -112.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -112 |
| Note2 | NR\_TDD\_FR1\_A Note3 | 1,3 | dBm/SRS SCS | -106 | -88 | -114 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -113 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -112.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -112 |
|  | NR\_TDD\_FR1\_A Note3 | 2,4 |  | Not applicableNote4 | -88 | -111 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -110 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -109.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -109 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 4: Test 1 is not used when testing with 30kHz SSB SCS | | | | | | |

Table 4.7.6.1.5-2: Neighbor UE specific test parameters for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
| Note2 | NR\_TDD\_FR1\_A NOTE 5 | 1,3 | dBm/15kHz | -106 | -88 | -114 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -113 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -112.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -112 |
|  | NR\_TDD\_FR1\_A NOTE 5 | 2,4 |  | Not applicableNote 6 | -91 | -114 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -113 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -112.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -112 |
| Note2 | NR\_TDD\_FR1\_A NOTE 5 | 1,3 | dBm/SRS SCS | -106 | -88 | -114 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -113 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -112.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -112 |
|  | NR\_TDD\_FR1\_A NOTE 5 | 2,4 |  | Not applicableNote 6 | -88 | -111 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -110 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -109.5 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -109 |
| on SRS | NR\_TDD\_FR1\_A NOTE 5 | 1,3 | dB | 1.5 | 1.5 | 1.75 |
| NR\_TDD\_FR1\_C | 1.5 |
| NR\_TDD\_FR1\_D | 1.5 |
| NR\_TDD\_FR1\_E | 1.5 |
| NR\_TDD\_FR1\_A NOTE 5 | 2,4 | Not applicableNote 6 | 1.5 | 2.25 |
| NR\_TDD\_FR1\_C | 1.5 |
| NR\_TDD\_FR1\_D | 1.5 |
| NR\_TDD\_FR1\_E | 1.5 |
| SRS RSRP Note3 | NR\_TDD\_FR1\_A NOTE 5 | 1,3 | dBm/SRS SCS | -104.5 | -86.5 | -112.25 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -111.5 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -111 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -110.5 |
|  | NR\_TDD\_FR1\_A NOTE 5 | 2,4 |  | Not applicableNote 6 | -86.49 | -108.74 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -108.49 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -107.99 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -107.49 |
| Io Note3 | NR\_TDD\_FR1\_A NOTE 5 | 1,3 | dBm/9.36 MHz | -74.42 | -56.42 | -82.28 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -81.42 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -80.92 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -80.42 |
|  | NR\_TDD\_FR1\_A NOTE 5 | 2,4 | dBm/38.16 MHz | Not applicableNote 6 | -54.80 | -77.49 |
|  | NR\_TDD\_FR1\_C |  |  |  |  | -76.80 |
|  | NR\_TDD\_FR1\_D |  |  |  |  | -76.30 |
|  | NR\_TDD\_FR1\_E |  |  |  |  | -75.80 |
| on SRS | NR\_TDD\_FR1\_A NOTE 5 | 1,3 | dB | 1.5 | 1.5 | 1.75 |
| NR\_TDD\_FR1\_C | 1.5 |
| NR\_TDD\_FR1\_D | 1.5 |
| NR\_TDD\_FR1\_E | 1.5 |
| NR\_TDD\_FR1\_A NOTE 5 | 2,4 | Not applicableNote 6 | 1.5 | 2.25 |
| NR\_TDD\_FR1\_C | 1.5 |
| NR\_TDD\_FR1\_D | 1.5 |
| NR\_TDD\_FR1\_E | 1.5 |
| Propagation condition | | 1,2,3,4 |  | AWGN | AWGN | AWGN |
| Antenna configuration | | 1,2,3,4 |  | 1x2 | 1x2 | 1x2 |
| SRS configuration | | 1,3 |  | SRSConf.1 | SRSConf.1 | SRSConf.1 |
|  | | 2,4 |  | SRSConf.2 | SRSConf.2 | SRSConf.2 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of the test.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 6: Test 1 is not used when testing with 30kHz SSB SCS  Note 7: For Test 3, values are specified based on NR\_TDD\_FR1\_X but they apply also to the FDD band group counterpart, NR\_FDD\_FR1\_X. Informatively, test parameters are defined based on band group A and then add ΔBG\_offset , which is the band group dependent component defined in clause 3A.4, Table 3A.4.1-2. | | | | | | |



Table 4.7.6.1.5-3: SRS configuration for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |
| --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 |
| SRS- | srs-ResourceSetId | 0 | 0 |
| ResourceSet | srs-ResourceIdList | 0 | 0 |
|  | resourceType | Periodic | Periodic |
|  | Usage | Codebook | Codebook |
| SRS- | SRS-ResourceId | 0 | 0 |
| Resource | nrofSRS-Ports | Port1 | Port1 |
|  | transmissionComb | n2 | n2 |
|  | combOffset-n2 | 0 | 0 |
|  | cyclicShift-n2 | 0 | 0 |
|  | resourceMapping  startPosition | 0 | 0 |
|  | resourceMapping  nrofSymbols | n1 | n1 |
|  | resourceMapping  repetitionFactor | n1 | n1 |
|  | freqDomainPosition | 0 | 0 |
|  | freqDomainShift | 0 | 0 |
|  | freqHopping  c-SRS | 12 | 12 |
|  | freqHopping  b-SRS | 0 | 0 |
|  | freqHopping  b-hop | 0 | 0 |
|  | groupOrSequenceHopping | Neither | Neither |
|  | resourceType | Periodic | Periodic |
|  | periodicityAndOffset-p | sl20, 9 | sl40, 19 |
|  | sequenceId | 0 | 0 |

Table 4.7.6.1.5-4: Absolute accuracy requirements for the reported values for test configurations 1 and 3 of EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2  All bands | Test 3 | |
| Lowest SRS-RSRP reported value | 30 | 45 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 23 |
| Bands NR\_TDD\_FR1\_C | 23 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 24 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 24 |
| Highest SRS-RSRP reported value | 41 | 62 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 33 |
| Bands NR\_TDD\_FR1\_C | 34 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 34 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 35 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | | |

Table 4.7.6.1.5-5: Absolute accuracy requirements for the reported values for test configurations 2 and 4 of EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2  All bands | Test 3 | |
| Lowest SRS-RSRP reported value | N/A Note 2 | 44 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 26 |
| Bands NR\_TDD\_FR1\_C | 26 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 26 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 27 |
| Highest SRS-RSRP reported value | N/A Note 2 | 63 | Bands NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | 37 |
| Bands NR\_TDD\_FR1\_C | 37 |
| Bands NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | 38 |
| Bands NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | 38 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2  Note 2: Test 1 is not used when testing with 30kHz SSB SCS | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.6.2 EN-DC CLI-RSSI measurement accuracy with FR1 serving cell

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

- TT analysis is missing.

- Test Procedure is FFS.

- Test applicability needs to be updated

4.7.6.2.1 Test purpose

To verify that the UE makes correct reporting of CLI-RSSI measurement accuracy in TS 38.133 [6] clause 10.1.22.2.1.

4.7.6.2.2 Test applicability

FFS.

4.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.6.2.

4.7.6.2.4 Test description

4.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.6.2.4.1-1. Test environment parameters are given in Table 4.7.6.2.4.1-2.

Table 4.7.6.2.4.1-1: Applicable NR configurations for FR1 CLI-RSSI accuracy test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Table 4.7.6.2.4.1-2: Test Environment parameters for EN-DC SSB based L1-RSRP measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 4.7.6.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CLI-RSSI measurements. Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 1 data symbol before.

4.7.6.2.4.2 Test procedure

FFS

4.7.6.2.4.3 Message contents

FFS

4.7.6.2.5 Test requirement

Table 4.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.7.6.2.5-1: NR Cell specific test parameters for CLI-RSSI accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~4 |  | freq1 |
| Duplex mode | 1~4 |  | TDD |
| TDD configuration | 1,3 |  | TDDConf.1.1 |
|  | 2,4 |  | TDDConf.2.1 |
| BWchannel | 1,3 | MHz | 10: NRB,c = 52 |
|  | 2,4 |  | 40: NRB,c = 106 |
| PDSCH Reference | 1,3 |  | SR.1.1 TDD |
| measurement channel | 2,4 |  | SR.2.1 TDD |
| RMSI CORESET Reference | 1,3 |  | CR.1.1 TDD |
| Channel | 2,4 |  | CR.2.1 TDD |
| Dedicated CORESET | 1,3 |  | CCR.1.1 TDD |
| Reference Channel | 2,4 |  | CCR.2.1 TDD |
| SSB configuration | 1,3 |  | SSB.1 FR1 |
|  | 2,4 |  | SSB.2 FR1 |
| OCNG Patterns Note6 | 1~4 |  | OP.1 |
| TRS configuration | 1,3 |  | TRS.1.1 TDD |
|  | 2,4 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~4 |  | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1~4 | μs | 17.67 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| on CLI-RSSI measurement resource Note2 | 1,3 | dBm/15kHz | -106 |
|  | 2,4 |  | -106 |
| on CLI-RSSI measurement resource Note2 | 1,3 | dBm/ BWP SCS | -106 |
|  | 2,4 |  | -103 |
| on CLI-RSSI measurement resource | 1~4 | dB | -Infinity |
| RSRP on CLI-RSSI measurement resource Note3 | 1~4 | dBm/ BWP SCS | -Infinity |
| Io on CLI-RSSI measurement resource Note3 | 1,3 | dBm/9.36 MHz | -78.05+TT |
|  | 2,4 | dBm/38.16 MHz | -71.96+TT |
| Io on CLI-RSSI measurement resource Note3 | 1,3 | dBm/1.08 MHz | -87.43+TT |
|  | 2,4 |  | -87.44+TT |
| on CLI-RSSI measurement resource | 1~4 | dB | -Infinity |
| Propagation condition | 1~4 |  | AWGN |
| Antenna configuration | 1~4 |  | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 6: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | |

Table 4.7.6.2.5-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy

|  |  |  |  |
| --- | --- | --- | --- |
|  | Field | Config | SRSConf.1 |
| CLI-RSSI | rssi-ResourceId | 1~4 | 0 |
| measurement | rssi-SCS | 1,3 | 15kHz |
| resource |  | 2,4 | 30kHz |
|  | startPRB | 1~4 | 0 |
|  | nrofPRBs | 1,3 | 52 |
|  |  | 2,4 | 106 |
|  | startPosition | 1~4 | 3 |
|  | nrofSymbols | 1~4 | 11 |
|  | rssi-PeriodicityAndOffset | 1,3 | sl20, 9 |
|  |  | 2,4 | sl40, 19 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.7 L1-SINR measurement for beam reporting

#### 4.7.7.0 Minimum conformance requirements

##### 4.7.7.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

The UE shall be capable of performing L1-SINR measurements with the CSI-RS configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only is defined in Table 4.7.7.0.1-1 for FR1 and in Table 4.7.7.0.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR1,

- P=, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion (TCSI-RS < MGRP)

- P=, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and

- TSMTCperiod ≠ MGRP or

- TSMTCperiod = MGRP and TCSI-RS < 0.5\*TSMTCperiod

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and TSMTCperiod = MGRP and TCSI-RS = 0.5\*TSMTCperiod

- P=, when CSI-RS is partially overlapped with measurement gap (TCSI-RS < MGRP) and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gap.

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with measurement gap (TSMTCperiod < MGRP)

Where:

TSMTCperiod = the configured SMTC1 period or SMTC2 period if configured.

TCSI-RS = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 4.7.7.0.1-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

Table 4.7.7.0.1-2: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only (ms) |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The accuracy requirements in Table 4.7.7.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.

- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.

- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 4.7.7.0.1-3.

Table 4.7.7.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | |
| Normal condition | Extreme condition | CSI-RS  CMR  Ês/Iot | Io Note 1 range | | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±5.5 | ±6.5 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.27.1.

##### 4.7.7.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR is defined in Table 4.7.7.0.2-1 for FR1 and in Table 4.7.7.0.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between PCMR and PIMR, i.e., P = max(PCMR, PIMR), where

- the value of PCMR shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1 of TS 38.133 [6], in which the occasions and period of the SSB for CMR shall be used instead.

- the value of PIMR shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

Table 4.7.7.0.2-1: Measurement period TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

Table 4.7.7.0.2-2: Measurement period TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 4.7.7.0.2-3 and 4.7.7.0.2-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.

- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 4.7.7.0.2-3 and 4.7.7.0.2-4.

Table 4.7.7.0.2-3: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | | |
| Normal condition | Extreme condition | SSB-  CMR  Ês/Iot | NZP-IMR  Ês/Iot | | Io Note 1 range | | | | |
|  |  |  | |  | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
|  |  |  | |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
|  |  |  | |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
|  |  |  | |  | NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| ±4.0 | ±5.0 | ≥0 | | ≥0 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
|  |  |  | |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
|  |  |  | |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | N/A | -50 |
|  |  |  | |  | NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
|  |  |  | |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | | |

Table 4.7.7.0.2-4: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB-  CMR  Ês/Iot | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -121 | -118 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | N/A | -50 |
| ±4.5 | ±5.5 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.27.2.

##### 4.7.7.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR is defined in Table 4.7.7.0.3-1 for FR1 and in Table 4.7.7.0.2-2 for FR2, where

For the value of M,

- M=1 shall be applied if

- aperiodic NZP-CSI-RS as CMR or dedicated IMR, or

- aperiodic CSI-IMR as dedicated IMR, or

- periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or

- periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;

- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between PCMR and PIMR, i.e., P = max(PCMR, PIMR), where

- The value of PCMR and PIMR shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 4.7.7.0.3-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.  Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

Table 4.7.7.0.3-2: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.  Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 4.7.7.0.3-3 and 4.7.7.0.3-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.

- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 4.7.7.0.3-3 and 4.7.7.0.3-4.

Table 4.7.7.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | | |
| Normal condition | Extreme condition | CSI-RS  CMR Ês/Iot | NZP-IMR  Ês/Iot | Io Note 1 range | | | | | |
|  |  |  |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB | dB | dB |  | dBm / SCSCSI-RS | | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±4.0 | ±5.0 | ≥0 | ≥0 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | | |

Table 4.7.7.0.3-4: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | |
| Normal condition | Extreme condition | CSI-RS  CMR Ês/Iot | Io Note 1 range | | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±4.5 | ±5.5 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.27.3.

#### 4.7.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement

##### 4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy

4.7.7.1.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

4.7.7.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

4.7.7.1.1.4 Test description

4.7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.1.1.4.1-2.

Table 4.7.7.1.1.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Table 4.7.7.1.1.4.1-2: Test Environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.7.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.1.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.7.1.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.1.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.1.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 4.7.7.1.1.5-2 or Table 4.7.7.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.1.1.5-1 as appropriate and repeat steps 3-5.

4.7.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.7.1.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR  Table H.3.6A-2 with conditions CSI-RS and PERIODIC  Table H.3.6A-3 with condition PERIODIC  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.7.1.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

4.7.7.1.1.5 Test requirement

Table 4.7.7.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.1.1.5-3 for test configurations 3 and 6.

Table 4.7.7.1.1.5-1: FR1 CSI-RS based L1-SINR test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | | 1~6 |  | freq1 | freq1 |
| Duplex mode | | 1,4 |  | FDD | FDD |
| 2,5 | TDD | TDD |
| 3,6 | TDD | TDD |
| TDD Configuration | | 1,4 |  | N/A | N/A |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.1 FR1 | SSB.1 FR1 |
| 2,5 | SSB.1 FR1 | SSB.1 FR1 |
| 3,6 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2,5 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3,6 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 |
| CSI-RS | | 1,4 |  | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| 2,5 | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| 3,6 | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | | 1~6 |  | periodic | periodic |
| reportQuantity-r16 | | 1~6 |  | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 1~6 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~6 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -96.00 | -117+ ΔBG\_offset |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -93.00 | -114+ ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + ΔBG\_offset |
| 3,6 | -83.00 | -116.2 + ΔBG\_offset |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + ΔBG\_offset |
| 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 |  | AWGN | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

Table 4.7.7.1.1.5-2: L1-SINR absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 52 | All Bands | 28 |
| Highest reported value (Cell 2) | 81 | All Bands | 57 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 51 | All Bands | 27 |
| Highest reported value (Cell 2) | 82 | All bands | 58 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

Table 4.7.7.1.1.5-3: L1-SINR absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 52 | All Bands | 28 |
| Highest reported value (Cell 2) | 81 | All Bands | 57 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 51 | All Bands | 27 |
| Highest reported value (Cell 2) | 82 | All Bands | 58 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

[IS: this new clause creates a duplication!!!!!!]

##### 4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy

4.7.7.1.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

4.7.7.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

4.7.7.1.2.4 Test description

4.7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.1.2.4.1-2.

Table 4.7.7.1.2.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Table 4.7.7.1.2.4.1-2: Test Environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.7.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.1.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.7.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.1.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.2.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 4.7.7.1.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

4.7.7.1.2.4.3 Message contents

Same message contents as described in section 4.7.7.1.1.4.3

4.7.7.1.2.5 Test requirement

Table 4.7.7.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.7.1.2.5-2.

Table 4.7.7.1.2.5-1

Same as Table 4.7.7.1.1.5-1

Table 4.7.7.1.2.5-2: L1-SINR relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR\_x - 9 | L1-SINR\_x - 9 |
| Highest reported value (CSI-RS#1) | L1-SINR \_x + 9 | L1-SINR \_x + 9 |
| Extreme Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR \_x - 10 | L1-SINR \_x - 10 |
| Highest reported value (CSI-RS#1) | L1-SINR \_x + 10 | L1-SINR \_x + 10 |
| L1-SINR\_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

4.7.7.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

4.7.7.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.2.

4.7.7.2.4 Test description

4.7.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.2.4.1-1.

Table 4.7.7.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.7.2.4.1-2.

Table 4.7.7.2.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.7.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-SINR measurements. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.2.5-1.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-SINR reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 4.7.7.2.5-2 or Table 4.7.7.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.2.5-1 as appropriate and repeat steps 3-5.

4.7.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.7.2.4.3-1: Common Exception messages EN-DC SSB based L1-SINR measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS\_IMR  Table H.3.6A-2 with conditions SSB and PERIODIC  Table H.3.6A-4 with condition PERIODIC  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.7.2.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

4.7.7.2.5 Test requirement

Table 4.7.7.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.2.5-3 for test configurations 3 and 6.

Table 4.7.7.2.5-1: FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | | 1~6 |  | freq1 | freq1 |
| Duplex mode | | 1,4 |  | FDD | FDD |
| 2,5 | TDD | TDD |
| 3,6 | TDD | TDD |
| TDD Configuration | | 1,4 |  | N/A | N/A |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.3 FR1 | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 | SSB.4 FR1 |
| CSI-IM configuration | | 1,4 |  | CSI-IM 1.1 FDD | CSI-IM 1.1 FDD |
| 2,5 |  | CSI-IM 1.1 TDD | CSI-IM 1.1 TDD |
| 3,6 |  | CSI-IM 2.1 TDD | CSI-IM 2.1 TDD |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2,5 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3,6 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~6 |  | periodic | periodic |
| reportQuantity-r16 | | 1~6 |  | ssb-Index-SINR-r16 | ssb-Index-SINR-r16 |
| Number of reported RS | | 1~6 |  | 2 | 2 |
| L1-SINR reporting period | | 1~6 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -96.00 | -117+ ΔBG\_offset |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -93.00 | -114+ ΔBG\_offset |
|  | | 1~6 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + ΔBG\_offset |
| 3,6 | -83.00 | -116.2 + ΔBG\_offset |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + ΔBG\_offset |
| 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + ΔBG\_offset |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |  |  |
|  | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 |  | AWGN | AWGN |
| antenna configuration | | 1~6 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

Table 4.7.7.2.5-2: L1-SINR absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

Table 4.7.7.2.5-3: L1-SINR absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement

##### 4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy

4.7.7.3.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

4.7.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support of L1-SINR measurements between an E-UTRA PCell and an NR PSCell.

4.7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.3.

4.7.7.3.1.4 Test description

4.7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.3.1.4.1-1.

Table 4.7.7.3.1.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based both CMR based IMR

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.7.3.1.4.1-2.

Table 4.7.7.3.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.7.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS based L1-SINR measurements. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.3.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.3.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0 and CSI-RS #1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 4.7.7.3.1.5-2 or Table 4.7.7.3.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.3.1.5-1 as appropriate and repeat steps 3-5.

4.7.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.7.3.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR and CSI-IM\_IMR  Table H.3.6A-2 with conditions CSI-RS and PERIODIC  Table H.3.6A-3 with condition PERIODIC  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 4.7.7.3.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

4.7.7.3.1.5 Test requirement

Table 4.7.7.3.5-1 defines the primary level settings not including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.3.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.3.1.5-3 for test configurations 3 and 6.

Table 4.7.7.3.1.5-1: FR1 L1-SINR measurement test with CSI-RS based both CMR and IMR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | | 1~6 |  | freq1 | freq1 |
| Duplex mode | | 1,4 |  | FDD | FDD |
|  | | 2,5 |  | TDD | TDD |
|  | | 3,6 |  | TDD | TDD |
| TDD Configuration | | 1,4 |  | N/A | N/A |
|  | | 2,5 |  | TDDConf.1.1 | TDDConf.1.1 |
|  | | 3,6 |  | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
|  | | 2,5 |  | 10: NRB,c = 52 | 10: NRB,c = 52 |
|  | | 3,6 |  | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| measurement channel | | 2,5 |  | SR.1.1 TDD | SR.1.1 TDD |
|  | | 3,6 |  | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| Channel | | 2,5 |  | CR.1.1 TDD | CR.1.1 TDD |
|  | | 3,6 |  | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| Reference Channel | | 2,5 |  | CCR.1.1 TDD | CCR.1.1 TDD |
|  | | 3,6 |  | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.1 FR1 | SSB.1 FR1 |
|  | | 2,5 |  | SSB.1 FR1 | SSB.1 FR1 |
|  | | 3,6 |  | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
|  | | 2,5 |  | TRS.1.1 TDD | TRS.1.1 TDD |
|  | | 3,6 |  | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 |
| CSI-RS configuration as CMR | | 1,4 |  | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
|  | | 2,5 |  | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
|  | | 3,6 |  | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| CSI-RS configuration as IMR | | 1,4 |  | CSI-RS 1.3A FDD | CSI-RS 1.3A FDD |
| 2,5 | CSI-RS 1.3A TDD | CSI-RS 1.3A TDD |
| 3,6 | CSI-RS 2.3A TDD | CSI-RS 2.3A TDD |
| reportConfigType | | 1~6 |  | periodic | periodic |
| reportQuantity-r16 | | 1~6 |  | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 1~6 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~6 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS | |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |  |  |
|  | | 1~6 | dB | 10 | 0.8 |
| Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -96.00 | -117+ ΔBG\_offset |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ ΔBG\_offset |
| 3,6 | -93.00 | -114+ ΔBG\_offset |
|  | | 1~6 | dB | 10 | 0.8 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + ΔBG\_offset |
| 3,6 | -83.00 | -116.2 + ΔBG\_offset |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + ΔBG\_offset |
| 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + ΔBG\_offset |
|  | | 1~6 | dB | 10 | 0.8 |
| Propagation condition | | 1~6 |  | AWGN | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | |

Table 4.7.7.3.1.5-2: L1-SINR absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

Table 4.7.7.3.1.5-3: L1-SINR absolute accuracy requirements for  
the reported values for test configurations 3 and 6

|  |  |  |  |
| --- | --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

##### 4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy

4.7.7.3.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

4.7.7.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.3.

4.7.7.3.2.4 Test description

4.7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.3.2.4.1-2.

Table 4.7.7.3.2.4.1-1: EN-DC CSI-RS based CMR with dedicated IMR L1-SINR measurement supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Table 4.7.7.3.2.4.1-2: Test Environment parameters for EN-DC CSI-RS based CMR with dedicated IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4.7.7.3.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.3.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.7.3.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.3.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.3.2.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 4.7.7.3.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.3.2.5-1 as appropriate and repeat steps 3-5.

4.7.7.3.2.4.3 Message contents

Same message contents as described in section 4.7.7.3.1.4.3

4.7.7.3.2.5 Test requirement

Table 4.7.7.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.3.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.7.3.2.5-2.

Table 4.7.7.3.2.5-1

Same as Table 4.7.7.3.1.5-1

Table 4.7.7.3.2.5-2: L1-SINR relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR\_x - 9 | L1-SINR\_x - 9 |
| Highest reported value (CSI-RS#1) | L1-SINR \_x + 9 | L1-SINR \_x + 9 |
| Extreme Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR \_x - 10 | L1-SINR \_x - 10 |
| Highest reported value (CSI-RS#1) | L1-SINR \_x + 10 | L1-SINR \_x + 10 |
| L1-SINR\_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 4A NE-DC with all NR cells in FR1

## 4A.0 General

This clause contains test scenarios for NR and E-UTRA dual connectivity with NR as PCell and E-UTRA and PSCell. This configuration is also known as NE-DC. All NR cells are in Frequency Range 1.

## 4A.1 Signalling characteristics

### 4A.1.1 E-UTRAN PSCell addition

#### 4A.1.1.0 Minimum conformance requirements

##### 4A.1.1.0.1 E-UTRA PSCell Addition Delay Requirement

This clause defines requirements for the delay within which the UE shall be able to configure an E-UTRAN PSCell in NR - E-UTRA dual connectivity. The requirements are applicable to an NR - E-UTRA dual connectivity capable UE.

Upon receiving E-UTRAN PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards E-UTRAN PSCell no later than in subframe *n* + Tconfig\_EUTRAN-PSCell:

Where:

Tconfig\_EUTRAN-PSCell = TRRC\_delay + Tactivation\_time + 50ms + TE-UTRAN-PSCell\_ DU

TRRC\_delay is the RRC procedure delay as specified in TS 38.331 [13].

Tactivation\_time is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then Tactivation\_time is 20ms. If the E-UTRAN PSCell is unknown, then Tactivation\_time is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

TE-UTRAN-PSCell\_DU is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell. TE-UTRAN-PSCell\_DU is up to 30ms.

E-UTRAN PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the E-UTRAN PSCell configuration command:

- the UE has sent a valid measurement report for the E-UTRAN PSCell being configured and

- the E-UTRAN PSCell being configured remains detectable according to the cell identification conditions specified in clause 8.8 of TS 36.133 [23],

- E-UTRAN PSCell being configured also remains detectable during the E-UTRAN PSCell configuration delay Tconfig\_EUTRAN-PSCell according to the cell identification conditions specified in clause 8.8 of TS 36.133 [23].

otherwise it is unknown.

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only during the RRC reconfiguration procedure [14].

##### 4A.1.1.0.2 E-UTRA PSCell Release Delay Requirement

The requirements in this clause shall apply for a UE which is configured with PCell and E-UTRAN PSCell and may also be configured with one or more SCells and/or E-UTRAN SCells.

Upon receiving E-UTRAN PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 38.331 [14] no later than in subframe *n+*TRRC\_delay:

Where

TRRC\_delay is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only during the RRC reconfiguration procedure [14].

#### 4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are FFS

4A.1.1.1.1 Test purpose

The purpose of this test is to verify that the LTE PSCell addition/release delay and interruption under NE-DC are within the specified requirements for the case when the PSCell is known by the UE at the time of addition.

4A.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards.

4A.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.1.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.1.1.

4A.1.1.1.4 Test description

4A.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.1.1.1.4.1-1.

Table 4A.1.1.1.4.1-1: Test configurations for NE-DC PSCell addition and Release test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 4A.1.1.1.4.1-2.

Table 4A.1.1.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | FFS | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4A.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4A.1.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4A.1.1.1.4.1-3.

Table 4A.1.1.1.4.1-3: General Test Parameters for PSCell Addition and Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test. One for NR cell and second for E-UTRAN Cell |
| Initial | Active PCell |  | Cell1 | PCell on RF channel number 1. |
|  | Neighbour cell |  | Cell2 | Neighbour cell on RF channel number 2. |
| Final | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Condition | Neighbour Cell |  | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
|  | Threshold RSRP  (Config 1,2,4,5) | dBm | -97 Note 1 | Actual RSRP threshold for event B1. |
|  | Threshold RSRP (Config 3,6) | dBm | -97 Note 2 | Actual RSRP threshold for event B1. |
|  | Time to Trigger | S | 0 |  |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | |  | 0 | Gaps are configured before T2 and released before T3. |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 0.5 | During this time the UE adds the PSCell. |
| T4 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T5 | | s | 0.5 | During this time the UE releases the PSCell. |
| Note 1: Value includes the TT based on the TT analysis results. Original value -96 dBm. TT: -1dB.  Note 2: Value includes the TT based on the TT analysis results. Original value -93 dBm. TT: -4dB. | | | | |

4A.1.1.1.4.2 Test Procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [6] clause 4.5.

2. The SS shall set the parameters according to Table 4A.1.1.1.5-1 and 4A.1.1.1.5-2 as appropriate. T1 starts

3. The SS shall transmit an RRCReconfiguration message with event B1 configured.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. When T1 expires, the SS shall set T2 parameters according to Table 4A.1.1.1.5-1 and 4A.1.1.1.5-2 as appropriate. T2 starts.

6. The UE shall transmit a MeasurementReport message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2.

7. The SS shall transmit an RRCReconfiguration message to release measurement gap.

8. The UE shall transmit an RRCReconfigurationComplete message.

9. The SS then shall transmit RRCReconfiguration message with condition NE-DC according to TS 38.508-1 [6] Table 4.6.1-13 to add E-UTRA cell (PSCell). T3 starts when the UE receives the RRC message.

10. The UE shall transmit an RRCReconfigurationComplete message.

11. The UE shall send a PRACH to PSCell during T3. The UE shall send PRACH no later than 120ms from the start of T3, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.

12. T4 starts.

13. During T4 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.

14. The SS shall transmit RRCReconfiguration message with condition NE-DC\_PSCell\_Rel according to TS 38.508-1 [6] Table 4.6.1-13 to release E-UTRA cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T5 starts when the UE receives the RRC message.

15. The UE shall transmit an RRCReconfigurationComplete message.

16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T5, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

17. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for the next iteration of the test procedure loop.

18. If the UE is not switched off, the SS shall transmit an RRCRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State RRC\_CONNECTED with generic parameter Connectivity NR with , Connected without release On. If paging succeeds, go to step 20, otherwise switches off the UE.

19. Switches on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR with Connected without release On according to TS 38.508-1 [14] clause 4.5.

20. Repeat step 2-19 until a test verdict has been achieved.

4A.1.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4A.1.1.1.4.3-1: Common exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

4A.1.1.1.5 Test Requirements

Table 4A.1.1.1.5-1 defines the primary level settings including test tolerances for NR Cell 1. Table 4A.1.1.1.5-2 defines primary level settings including test tolerances for E-UTRA Cell 2.Table 4A.1.1.1.5-1: NR Cell Specific Parameters for PSCell Addition and Release

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Config | Test |
|  |  |  |
| NR RF Channel Number |  | 1,2,3,4,5,6 | 1 |
| E-UTRA RF Channel Number |  | 1,2,3,4,5,6 | 2 |
| TDD |  | 1,4 | Not Applicable |
| configuration |  | 2,5 | TDDConf.1.1 |
|  |  | 3,6 | TDDConf.2.1 |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 |
|  |  | 2,5 | 10: NRB,c = 52 |
|  |  | 3,6 | 40: NRB,c = 106 |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 |
| PDSCH Reference |  | 1,4 | SR.1.1 FDD |
| measurement |  | 2,5 | SR.1.1 TDD |
| channel |  | 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference |  | 1,4 | CR.1.1 FDD |
| Channel |  | 2,5 | CR.1.1 TDD |
|  |  | 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference |  | 1,4 | CCR.1.1 FDD |
| Channel |  | 2,5 | CCR.1.1 TDD |
|  |  | 3,6 | CCR.2.1 TDD |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 |
| SSB configuration |  | 1,2,4,5 | SSB.1 FR1 |
|  |  | 3,6 | SSB.2 FR1 |
| SMTC configuration |  | 1,2,4,5 | SMTC.1 |
|  |  | 3,6 | SMTC.1 |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD |
|  |  | 2,5 | TRS.1.1 TDD |
|  |  | 3,6 | TRS.1.2 TDD |
| CSI-RS configuration for CSI reporting |  | 1,4 | CSI-RS.1.1 FDD |
|  |  | 2,5 | CSI-RS.1.1 TDD |
|  |  | 3,6 | CSI-RS.2.1 TDD |
| reportConfigType |  | 1,2,3,4,5,6 | periodic |
| reportQuantity |  | 1,2,3,4,5,6 | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 |
|  |  | 3,6 | 10 |
| CSI reporting offset | slot | 1,2,4,5 | 2 |
|  |  | 3,6 | 4 |
| EPRE ratio of PSS to SSS |  |  |  |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 1,2,3,4,5,6 | 0 |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -88 |
| Note2 | dBm/SCS | 1,2,4,5 | -88 |
|  |  | 3,6 | -85 |
|  |  | 1,2,3,4,5,6 | 0 |
|  |  | 1,2,3,4,5,6 | 0 |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -88 |
|  |  | 3,6 | -85 |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | -57 |
|  | dBm/38.1MHz | 3,6 | -51 |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | |

Table 4A.1.1.1.5-2: E-UTRAN cell specific test parameters for PSCell Addition and Release tests

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | E-UTRAN Cell | | | | | |
| T1 | T2 | | T3 | T4 | T5 |
| Duplex mode |  | FDD or TDD | | | | | |
| TDD special subframe configurationNote1 |  | 6 | | | | | |
| TDD uplink-downlink configurationNote1 |  | 1 | | | | | |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | | | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | | | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | | | | |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | | | | |
| PBCH\_RA | dB |  | | | | | |
| PBCH\_RB | dB |  | | | | | |
| PSS\_RA | dB |  | | | | | |
| SSS\_RA | dB |  | | | | | |
| PCFICH\_RB | dB |  | | | | | |
| PHICH\_RA | dB |  | | | | | |
| PHICH\_RB | dB | 0 | | | | | |
| PDCCH\_RA | dB |  | | | | | |
| PDCCH\_RB | dB |  | | | | | |
| PDSCH\_RA | dB |  | | | | | |
| PDSCH\_RB | dB |  | | | | | |
| OCNG\_RANote3 | dB |  | | | | | |
| OCNG\_RBNote3 | dB |  | | | | | |
| NocNote4 | dBm/15 kHz | N/A | | -104 | | | |
| Ês/Noc | dB | -infinite | | 17 | | | |
| Ês/Iot | dB | -infinite | | 17 | | | |
| RSRP Note5 | dBm/15 kHz | -infinite | | -87 | | | |
| SCH\_RP Note5 | dBm/15 kHz | -infinite | | -87 | | | |
| Io Note5 | dBm/Ch BW | N/A | | -59.13+10log(NRB,c /50) | | | |
| Propagation Condition |  | AWGN | | | | | |
| Antenna Configuration |  | 1x2 | | | | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The UE shall transmit the PRACH to PSCell at latest 120 msNote1 into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest 20ms into T5.

Interruption on PCell during PSCell addition and release shall not exceed the values specified for NE-DC in Clause 8.2.3.2.3 of TS 38.133 [4].

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

### 4A.1.2 Active BWP switch delay

#### 4A.1.2.0 Minimum conformance requirements

FFS

#### 4A.1.2.1 NE-DC FR1 DCI-based and timer-based DL active BWP switch in non-DRX in synchronous NE-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Test procedure is FFS

- Test applicability in TS 38.522 is FFS

- Test requirements contain values in [.]

- Message contents are FFS

4A.1.2.1.1 Test purpose

The purpose of this test is to verify that the active BWP switch delay under NE-DC is within the specified requirements for the case.

4A.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards. This test requires support of DCI and timer based active BWP switching delay type1 or type2 (*bwp-SwitchingDelay)* and BWP adaptation of at least 2BWPs (*bwp-SameNumerology)*.

4A.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.1.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.1.2.

4A.1.2.1.4 Test description

4A.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.12.4.1-1.

Table 4A.1.2.1.4.1-1: Test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 4A.1.2.1.4.1-2.

Table 4A.1.2.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | FFS | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4A.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4A.1.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The power levels and settings for Cell 2 are set according to Annex A.6. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4A.1.2.1.4.1-3.

Table 4A.1.2.1.4.1-3: General test parameters for DL BWP switch in synchronous NE-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| E-UTRA RF Channel Number |  | 2 | One E-UTRA radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | [200] |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous NE-DC |
| T1 | s | [0.2] |  |
| T2 | s | [0.2] |  |
| T3 | s | [0.2] |  |

4A.1.2.1.4.2 Test Procedure

1. FFS.

4A.1.2.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4A.1.2.1.4.3-1: Common exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

4A.1.2.1.5 Test Requirements

Table 4A.1.2.1.5-1 defines the primary level settings including test tolerances for NR Cell 1.

Table 4A.1.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous NE-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
|  | Config 2,3,5,6 |  | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
|  | Config 2,5 |  | TDDConf.1.1 |
|  | Config 3,6 |  | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | 10 MHz: NRB,c = 52 |
|  | Config 2,5 |  | 10 MHz: NRB,c = 52 |
|  | Config 3,6 |  | 40 MHz: NRB,c = 106 |
| Active BWP ID | |  | 1, 2 |
| Initial DL BWP | Config 1,4 |  | DLBWP.0.2 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active DL BWP-1 | Config 1,4 |  | DLBWP.1.1 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active DL BWP-2 | Config 1,4 |  | DLBWP.1.3 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Initial UL BWP | Config 1,4 |  | ULBWP.0.2 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active UL BWP-1 | Config 1,4 |  | ULBWP.1.1 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active UL BWP-2 | Config 1,4 |  | ULBWP.1.3 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| PDSCH Reference | Config 1,4 |  | SR.1.1 FDD |
| measurement channel | Config 2,5 |  | SR.1.1 TDD |
|  | Config 3,6 |  | SR.2.1 TDD |
| RMSI CORESET | Config 1,4 |  | CR.1.1 FDD |
| parameters | Config 2,5 |  | CR.1.1 TDD |
|  | Config 3,6 |  | CR.2.1 TDD |
| Dedicated CORESET | Config 1,4 |  | CCR.1.1 FDD |
| parameters | Config 2,5 |  | CCR.1.1 TDD |
|  | Config 3,6 |  | CCR.2.3 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
|  | Config 3,6 |  | SSB.2 FR1 |
| SMTC Configuration |  |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| TRS Configuration | Config 1,4 |  | TRS.1.1 FDD |
|  | Config 2,5 |  | TRS.1.1 TDD |
|  | Config 3,6 |  | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | |  |  |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| NocNote 2 | Config 1,2,4,5 | dBm/SCS | [-104] |
|  | Config 3,6 |  | [-101] |
| NocNote 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | [-87] |
|  | Config 3,6 |  | [-90] |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | [-59] |
|  | Config 3,6 | dBm/38.16MHz | [-61.9] |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213. | | | |

During T1, the UE shall start to send the ACK for PCell in the DL slot right after DL slot (*i+TBWPswitchDelay*+*k1*).

During T3, the UE shall start to send the ACK for PCell in the DL slot right after DL slot (*j+TBWPswitchDelay*+*k1*).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration *TBWPswitchDelay* defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of PSCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PSCell interruption of during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.36.2.6.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 4A.2 Measurement performance requirements

### 4A.2.1 SFTD accuracy

#### 4A.2.1.0 Minimum conformance requirements

##### 4A.1.1.0.1 NE-DC SFTD accuracy Requirement

The SFN and frame timing difference (SFTD) is measured between PCell and E-UTRAN PSCell under NE-DC.

The accuracy requirements in Table 4A.2.1.1.3-4 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Io range defined in Table 4A.2.1.1.3-1.

Table 4A.2.1.1.3-1: PCell Io range conditions in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Io Note 1 range | | | |
| NR operating band groups Note 4, 5 | Minimum Io Note 2, 3 | | Maximum Io |
|  | dBm/ SCSSSB | | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| Conditions | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A | -121 | -118 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The condition level is increased by ΔRIB,c as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA – NR band combination.  NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA – NR band combination.  NOTE 4: NR operating band groups are as defined in clause 3A.4.1.  NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable. | | | | |

For FR2 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [2] for reference sensitivity are fulfilled.

- Io range defined in Table 4A.2.1.1.3-2.

Table 4A.2.1.1.3-2: PCell Io range conditions in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Io Note 1 range | | |
| Minimum Io Note 2, 3 | | Maximum Io |
| dBm/ SCSSSB | | dBm/BWChannel |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| Conditions | Same value as SSB\_RP in Table B.2.4.1-2 of TS 38.133[6], according to UE Power class, operating band and angle of arrival | Same value as SSB\_RP in Table B.2.4.1-2 of TS 38.133[6], according to UE Power class, operating band and angle of arrival | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth and specified at the Reference point.  NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [2]. Applicable side condition selected depending on angle of arrival.  NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | |

For E-UTRA PSCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.

- Conditions defined in TS 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

- No changes to the uplink transmission timing are applied during the measurement period.

- RSRP|dBm according to Annex B.3.5 in TS 36.101 [27] for a corresponding Band.

- Io range defined in Table 4A.2.1.1.3-3.

Table 4A.2.1.1.3-3: E-UTRA PSCell Io range conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Io Note 1 range | | |
| E-UTRA operating band groups Note 3 | Minimum Io | Maximum Io |
| Conditions |  | dBm/15kHz Note 2 | dBm/BWChannel |
| FDD\_A, TDD\_A | -121 | -50 |
| FDD\_C, TDD\_C | -120 | -50 |
| FDD\_D | -119.5 | -50 |
| FDD\_E, TDD\_E | -119 | -50 |
| FDD\_F | -118.5 | -50 |
| FDD\_G | -118 | -50 |
| FDD\_H | -117.5 | -50 |
| FDD\_N | -114.5 | -50 |
| NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.  NOTE 2: The condition level is increased by ∆>0, when applicable, as described in clauses B.4.2 and B.4.3 in TS36.133 [23].  NOTE 3: E-UTRA operating band groups are as defined in clause 3.5 in TS 36.133 [23]. | | | |

Table 4A.2.1.1.3-4: SFTD measurement accuracy

|  |  |  |
| --- | --- | --- |
| Accuracy | Conditions | |
| Ês/Iot Note 2 | Frequency range |
| Ts Note 1 | dB |  |
| 40\*64\*Tc | ≥-3 dB | FR1 |
| 40\*64\*Tc | FR2 |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].  NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies. | | |

#### 4A.2.1.1 NE-DC FR1 SFTD accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Message contents are FFS

4A.2.1.1.1 Test purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits.

4A.2.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards. This test requires support of SFTD measurements between an NR PCell and an E-UTRA PSCell (*sftd-MeasPSCell-NEDC)*.

4A.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.2.1.

4A.2.1.1.4 Test description

4A.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.2.1.1.4.1-1.

Table 4A.2.1.1.4.1-1: Supported test configurations for SFTD accuracy

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 4A.2.1.1.4.1-2.

Table 4A.2.1.1.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | FFS | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4A.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| TE Part 4Rx | A.3.1.8.5 with n = 1 |
| DUT Part 2Rx | A.3.2.3.4 |
| DUT Part 4Rx | A.3.2.5.2 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 4A.1.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The power levels and settings for Cell 2 are set according to Annex A.6. The connection setup is done according to the settings in clause C.1.1.

4A.2.1.1.4.2 Test Procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to Table 4A.2.1.1.5-1 and Table 4A.2.1.1.5-1 as appropriate. (Condition = 3)

3. The SS shall transmit an RRReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit a MeasurementReport containing the MeasResultCellListSFTD-r15 for the PSCell with SFTD measurements.

6. The SS shall check the reported SFN offset and frame boundary offset between the NR PCell and the E-UTRA PSCell. The number of failed iterations is increased by one if

- The value of *sfn-OffsetResult* is different with the expected SFN offset value, or

- The value of *frameBoundaryOffsetResult* is outside the range given in Table 4A.2.1.1.5-3, or

- The UE fails to report the measurement value for Cell 2.

Otherwise the number of successful iterations is increased by one.

7. Switch off and on the UE and ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [6] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4A.2.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4A.2.1.1.4.3-1: Common exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

4A.2.1.1.5 Test Requirements

Table 4A.2.1.1.5-1 defines the primary level settings including test tolerances for NR Cell 1

Table 4A.2.1.1.5-1: Test parameters for SFTD accuracy (Cell 1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 |
| SSB GSCN | | 1~6 |  | freq1 |
| Duplex mode | | 1,4 |  | FDD |
|  | | 2,5 |  | TDD |
|  | | 3,6 |  | TDD |
| TDD Configuration | | 1,4 |  | N/A |
|  | | 2,5 |  | TDDConf.1.1 |
|  | | 3,6 |  | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 |
|  | | 2,5 |  | 10: NRB,c = 52 |
|  | | 3,6 |  | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD |
|  | | 2,5 |  | SR.1.1 TDD |
|  | | 3,6 |  | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD |
|  | | 2,5 |  | CR.1.1 TDD |
|  | | 3,6 |  | CR.2.1 TDD |
| RMC CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD |
|  | | 2,5 |  | CCR.1.1 TDD |
|  | | 3,6 |  | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.1 FR1 |
|  | | 2,5 |  | SSB.1 FR1 |
|  | | 3,6 |  | SSB.2 FR1 |
| SMTC configuration | | 1~6 |  | SMTC.1 |
| DL BWP configuration | | 1~6 |  | DLBWP.1.1 |
| UL BWP configuration | | 1~6 |  | ULBWP.1.1 |
| OCNG Patterns | | 1~6 |  | OP.1 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~6 | dBm/15kHz | -104 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -104 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -101 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
|  | | 1~6 | dB | 2.7 |
|  | | 1~6 | dB | 2.7 |
| SS-RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SCS | -107 |
|  | NR\_FDD\_FR1\_B |  |
|  | NR\_TDD\_FR1\_C |  |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |
|  | NR\_FDD\_FR1\_F |  |
|  | NR\_FDD\_FR1\_G |  |
|  | NR\_FDD\_FR1\_H |  |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 |  | -104 |
|  | NR\_FDD\_FR1\_B |  |
|  | NR\_TDD\_FR1\_C |  |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |
|  | NR\_FDD\_FR1\_F |  |
|  | NR\_FDD\_FR1\_G |  |
|  | NR\_FDD\_FR1\_H |  |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -74.18 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | dBm/38.16 MHz | -65.08 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
| Propagation condition | | 1~6 |  | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | |

Table 4A.2.1.1.5-2: Timing offsets for SFTD accuracy test

|  |  |  |
| --- | --- | --- |
| Configuration | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and E-UTRAN target cell. The reported SFTD accuracy shall fulfil the requirement in clause 10.1.21.1 of TS 38.133 [4].