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## Foreword

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where:

- x the first digit:
  - 1 presented to TSG for information;
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  - 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.

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## 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.

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## 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".

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## 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].

**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].

**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.
$BW_{\text{Channel}}$	Channel bandwidth, defined in TS 38.101-1 [2], 38.101-2 [3] and 38.101-3 [4] subclause 3.2
$\hat{E}_s$	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
$I_o$	The total received power density, including signal and interference, as measured at the UE antenna connector.
$I_{oc}$	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
$N_{oc}$	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 and 38.304 subclause 5.2.4.7 for NR
Snonintrasearch	Defined in TS 38.304 [30], subclause 5.2.4.7
Thresh <sub>x, high</sub>	Defined in TS 38.304 [30], subclause 5.2.4.7
Thresh <sub>x, low</sub>	Defined in TS 38.304 [30], subclause 5.2.4.7
Thresh <sub>serv, low</sub>	Defined in TS 38.304 [30], subclause 5.2.4.7
T <sub>RE-ESTABLISH-REQ</sub>	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. T <sub>c</sub> Basic time unit, defined in clause 4.1 of 3GPP TS 38.211 [7].
T <sub>s</sub>	Reference time unit, defined in clause 4.1 of 3GPP TS 38.211 [7].
T <sub>UE_re-establish_delay</sub>	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
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
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
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
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
SCS <sub>SSB</sub>	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

## 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 <sup>5</sup>	
	Band group notation	Operating bands	Band group notation	Operating bands	Band group notation	Operating bands
A	NR_FDD_FR1_A	n1, n18, n24, n70, n74 <sup>4</sup>	NR_TDD_FR1_A	n34, n38 <sup>9</sup> , n39, n40, n50, n51, n53	NR_SDL_FR1_A	n75, n76
B	NR_FDD_FR1_B	n65, n66, n74 <sup>3</sup>	NR_TDD_FR1_B	n38 <sup>7</sup>	NR_SDL_FR1_B	-
C	NR_FDD_FR1_C	n30	NR_TDD_FR1_C	n48, n77 <sup>1</sup> , n78, n79	NR_SDL_FR1_C	-
D	NR_FDD_FR1_D	n28	NR_TDD_FR1_D	n77 <sup>2</sup>	NR_SDL_FR1_D	-
E	NR_FDD_FR1_E	n2, n5, n7	NR_TDD_FR1_E	n41	NR_SDL_FR1_E	-
F	NR_FDD_FR1_F	n26 <sup>6</sup>	NR_TDD_FR1_F	-	NR_SDL_FR1_F	-
G	NR_FDD_FR1_G	n3, n8, n12, n14, n20, n71	NR_TDD_FR1_G	-	NR_SDL_FR1_G	n29
H	NR_FDD_FR1_H	n25	NR_TDD_FR1_H	-	NR_SDL_FR1_H	-
J	NR_FDD_FR1_J	-	NR_TDD_FR1_J	n47 <sup>8</sup>	NR_SDL_FR1_J	-

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 3GPP TS 38.101-1 [18] and TS 38.101-3 [20].  
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.

**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], $\Delta_{BG\_offset}$	Band group notation	Power Offset [dB], $\Delta_{BG\_offset}$	Band group notation	Operating bands
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.

### 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	n257 <sup>1</sup> , n258 <sup>1</sup> , n261 <sup>1</sup>
B	NR_TDD_FR2_B	n257 <sup>4</sup> , n258 <sup>4</sup> , n261 <sup>4</sup>
C	NR_TDD_FR2_C	
D	NR_TDD_FR2_D	
E	NR_TDD_FR2_E	
F	NR_TDD_FR2_F	n260 <sup>4</sup>
G	NR_TDD_FR2_G	n260 <sup>1</sup>
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	n257 <sup>2</sup> , n258 <sup>2</sup> , n261 <sup>2</sup>
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	n257 <sup>3</sup> , n258 <sup>3</sup> , n261 <sup>3</sup>
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	n260 <sup>3</sup>
Z	NR_TDD_FR2_Z	
AA	NR_TDD_FR2_AA	n259 <sup>3</sup>
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
	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 {			
I139	0		
}			
msg1-SubcarrierSpacing	kHz 15 kHz 30		15 kHz 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	sf10		
}			

**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 <sup>Note 1</sup>			OCNG pattern 1	As defined in clause A.2.1.	
PDSCH parameters <sup>Note 4</sup>	Config 1,2		SR.1.1 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	$\hat{E}_s / I_{ot}$	dB	3	Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz		-98
		Config 3,4			-101
	$\hat{E}_s / N_{oc}$	dB	3		
	SS-RSRP	Config 1,2	dBm / 15kHz		-95
		Config 3,4			-98
SS-RSRP		dBm/ SCS	-95		
SSB with index 1	$\hat{E}_s / I_{ot}$	dB	-17	Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz		-98
		Config 3,4			-101
	$\hat{E}_s / N_{oc}$	dB	-17		
	SS-RSRP	Config 1,2	dBm / 15kHz		-115
		Config 3,4			-118
SS-RSRP		dBm/ SCS	-115		
$I_o$ <sup>Note 2</sup>	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 ( $P_{C,MAX, f,c}$ )		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: $E_s/I_{ot}$ , SS-RSRP and $I_o$ 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	$\pm 11.1$ dB

**Table 4.3.2.2.1.5-3: Relative power tolerance Test requirements**

Power step $\Delta P$ (Up or down) (dB)	PRACH (dB)
$2 \leq \Delta P < 3$	$\pm 3.2$

**Table 4.3.2.2.1.5-4:  $T_e$  Timing error Test requirements**

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(kHz)	$T_e$
1	15	15	$880 \cdot T_c$
	30	30	$624 \cdot T_c$

NOTE:  $T_c$  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 preamble with 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 4.3.2.2.4.1-1: 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 4.3.2.2.4.1-2.

**Table 4.3.2.2.4.1-2: 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 4.3.2.2.4.1-1.		
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 4.3.2.2.4.3.
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 4.3.2.2.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.

#### 4.3.2.2.4.2 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 4.3.2.2.5-1.
3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to the Tables for Non-Contention Random Access in clause 4.3.2.2.4.3.
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 kHz 30		15kHz 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		
}			
}			
}			
}			

#### 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 <sup>Note 1</sup>		OCNG pattern 1	OCNG pattern 1	As defined in clause A.2.1
	Config 1,2	SR1.1 FDD	SR1.1 FDD	

Parameter		Unit	Test-1	Test-2	Comments	
PDSCH parameters <small>Note 4</small>	Config 3,4		SR2.1 TDD	SR2.1 TDD	As defined in clause A.1.1	
RMSI CORESET reference channel	Config 1,2 Config 3,4		CR.1.1 FDD CR.2.1 TDD	CR.1.1 FDD CR.2.1 TDD		
Dedicated CORESET reference channel	Config 1,2 Config 3,4		CCR.1.1 FDD CCR.2.1 TDD	CCR.1.1 FDD CCR.2.1 TDD		
NR RF Channel Number			1	1		
EPRE ratio of PSS to SSS		dB				
EPRE ratio of PBCH_DMRS to SSS		dB				
EPRE ratio of PBCH to PBCH_DMRS		dB				
EPRE ratio of PDCCH_DMRS to SSS		dB	0	0		
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	$\hat{E}_s / I_{ot}$	dB	3	3	Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz	-98		-98
		Config 3,4		-101		-101
	$\hat{E}_s / N_{oc}$		dB	3		3
	SS-RSRP <small>Note 3</small>	Config 1,2	dBm/15kHz	-95		-95
		Config 3,4		-98		-98
SS-RSRP <small>Note 3</small>		dBm/ SCS	-95	-95		
SSB with index 1	$\hat{E}_s / I_{ot}$	dB	-17	-17	Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz	-98		-98
		Config 3,4		-101		-101
	$\hat{E}_s / N_{oc}$		dB	-17		-17
	SS-RSRP <small>Note 3</small>	Config 1,2	dBm/15kHz	-115		-115
		Config 3,4		-118		-118
SS-RSRP <small>Note 3</small>		dBm/ SCS	-115	-115		
$I_o$ <small>Note 2</small>	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 ( $P_{CMAX, f,c}$ )		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: $E_s/I_{ot}$ , SS-RSRP and $I_o$ 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	$\pm 11.1$ dB

**Table 4.3.2.2.2.5-3: Relative power tolerance Test requirements**

Power step $\Delta P$ (Up or down) (dB)	PRACH (dB)
$2 \leq \Delta P < 3$	$\pm 3.2$

**Table 4.3.2.2.2.5-4:  $T_e$  Timing error Test requirements**

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	$T_e$
1	15	15	$880 \cdot T_c$
	30	30	$624 \cdot T_c$

NOTE:  $T_c$  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 TS 38.101-2 [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 <sup>Note 1</sup>			OCNG pattern 1	As defined in clause A.2.1.	
PDSCH parameters <sup>Note 4</sup>	Config 1,2		SR.1.1 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	$\hat{E}_s / I_{ot}$	dB	3	Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz		-98
		Config 3,4			-101
	$\hat{E}_s / N_{oc}$	dB	3		
	SS-RSRP	Config 1,2	dBm / 15kHz		-95
		Config 3,4			-98
SS-RSRP		dBm/ SCS	-95		
SSB with index 1	$\hat{E}_s / I_{ot}$	dB	-17	Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz		-98
		Config 3,4			-101
	$\hat{E}_s / N_{oc}$	dB	-17		
	SS-RSRP	Config 1,2	dBm / 15kHz		-115
		Config 3,4			-118
SS-RSRP		dBm/ SCS	-115		
$I_o$ <sup>Note 2</sup>	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 ( $P_{CMAX, f,c}$ )		dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].	
MsgA Configuration			FR1 MsgA configuration 1		
<i>msgA-RSRP-ThresholdSSB</i>		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, $E_s/I_{ot}$ and $I_o$ 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	$\pm 11.1$ dB

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

Conditions	Tolerance
Normal	$\pm 11.1$ dB

**Table 4.3.2.2.3.5-3: Relative power tolerance Test requirements**

Power step $\Delta P$ (Up or down) (dB)	MsgA PRACH (dB)
$2 \leq \Delta P < 3$	$\pm 3.2$ dB

**Table 4.3.2.2.3.5-4:  $T_e$  Timing error Test requirements**

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	$T_e$
1	15	15	$880 \cdot T_c$
	30	30	$624 \cdot T_c$

NOTE:  $T_c$  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 TS 38.101-2 [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 preamble with 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 <sup>Note 1</sup>			OCNG pattern 1	As defined in clause A.2.1.		
PDSCH parameters <sup>Note 4</sup>	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	$\hat{E}_s / I_{ot}$	dB		3	Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz	-98		
		Config 3,4		-101		
	$\hat{E}_s / N_{oc}$	dB	3			
	SS-RSRP	Config 1,2	dBm / 15kHz	-95		
		Config 3,4		-98		
	SS-RSRP	dBm/ SCS		-95		
SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i>	
	$N_{oc}$	Config 1,2	dBm/15kHz	-98		
		Config 3,4		-101		
	$\hat{E}_s / N_{oc}$		dB	-17		
	SS-RSRP	Config 1,2	dBm / 15kHz			-115
		Config 3,4				-118
	SS-RSRP	dBm/ SCS		-115		
$I_o$ <sup>Note 2</sup>	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 ( $P_{C,MAX, f,c}$ )		dBm		23	As defined in clause 6.2.4 in TS 38.101-1 [2].	
MsgA Configuration			FR1 MsgA configuration 2			
<i>msgA-RSRP-ThresholdSSB</i>		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	$\pm 11.1$ dB

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

Conditions	Tolerance
Normal	$\pm 11.1$ dB

**Table 4.3.2.2.4.5-3: Relative power tolerance Test requirements**

Power step $\Delta P$ (Up or down) (dB)	MsgA PRACH (dB)
$2 \leq \Delta P < 3$	$\pm 3.2$ dB

**Table 4.3.2.2.4.5-4:  $T_e$  Timing error Test requirements**

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	$T_e$
1	15	15	$880 \cdot T_c$
	30	30	$624 \cdot T_c$

NOTE:  $T_c$  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  $\pm T_e$  where the timing error limit value  $T_e$  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  $T_e$  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  $(N_{TA} + N_{TA\text{ offset}}) \times T_c$ . 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.

$(N_{TA} + N_{TA\text{ offset}}) \times T_c$  (in  $T_c$  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 of  $N_{TA\text{ offset}}$  depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR).  $N_{TA\text{ offset}}$  is defined in Table 4.4.1.0.1-2.

**Table 4.4.1.0.1-1:  $T_e$  Timing Error Limit**

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals s(KHz)	$T_e$
1	15	15	$12 \cdot 64 \cdot T_c$
		30	$10 \cdot 64 \cdot T_c$
		60	$10 \cdot 64 \cdot T_c$
	30	15	$8 \cdot 64 \cdot T_c$
		30	$8 \cdot 64 \cdot T_c$
		60	$7 \cdot 64 \cdot T_c$
2	120	60	$3.5 \cdot 64 \cdot T_c$
		120	$3.5 \cdot 64 \cdot T_c$
	240	60	$3 \cdot 64 \cdot T_c$
		120	$3 \cdot 64 \cdot T_c$

NOTE:  $T_c$  is the basic timing unit defined in TS 38.211 [6].

**Table 4.4.1.0.1-2: The Value of  $N_{TA\ offset}$** 

Frequency range and band of cell used for uplink transmission	$N_{TA\ offset}$ (Unit: $T_c$ )
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 $N_{TA\ offset}$ 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 $N_{TA\ offset}$ 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 $N_{TA\ offset}$ 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  $\pm T_e$ , the UE is required to adjust its timing to within  $\pm T_e$ . The reference timing shall be  $(N_{TA} + N_{TA\ offset}) \times T_c$  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  $T_q$ .
- 2) The minimum aggregate adjustment rate shall be  $T_p$  per second.
- 3) The maximum aggregate adjustment rate shall be  $T_q$  per 200ms.

where the maximum autonomous time adjustment step  $T_q$  and the aggregate adjustment rate  $T_p$  are specified in Table 4.4.1.0.1-3.

**Table 4.4.1.0.1-3:  $T_q$  Maximum Autonomous Time Adjustment Step and  $T_p$  Minimum Aggregate Adjustment rate**

Frequency Range	SCS of uplink signals (KHz)	$T_q$	$T_p$
1	15	$5.5 \cdot 64 \cdot T_c$	$5.5 \cdot 64 \cdot T_c$
	30	$5.5 \cdot 64 \cdot T_c$	$5.5 \cdot 64 \cdot T_c$
	60	$5.5 \cdot 64 \cdot T_c$	$5.5 \cdot 64 \cdot T_c$
2	60	$2.5 \cdot 64 \cdot T_c$	$2.5 \cdot 64 \cdot T_c$
	120	$2.5 \cdot 64 \cdot T_c$	$2.5 \cdot 64 \cdot T_c$
NOTE: $T_c$ 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
	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 PCell 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 transmissions and verify that, for each received SRS, the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB:
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600 for FR1.
  - b. The  $T_e$  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  $T_1$  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  $1 + \text{offset}$  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  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  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		
BW <sub>channel</sub>	MHz	1,4	10: N <sub>RB,c</sub> = 52		
		2,5	10: N <sub>RB,c</sub> = 52		
		3,6	40: N <sub>RB,c</sub> = 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.8 <sup>Note5</sup>	
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 DMRS					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
$N_{oc}$ <sup>Note2</sup>					
$N_{oc}$ <sup>Note2</sup>	dBm/SCS	1,2,4,5	-98	-98	
		3,6	-95	-95	
$\hat{E}_s / I_{oi}$		1,2,3,4,5,6	3.3	3.3	
$\hat{E}_s / N_{oc}$		1,2,3,4,5,6	3.3	3.3	
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2,4,5	-95	-95	
		3,6	-92	-92	
I <sub>o</sub> <sup>Note3</sup>	dBm/9.36MHz	1,2,4,5	-65.08	-65.08	
	dBm/38.1MHz	3,6	-61.99	-61.99	

Parameter	Unit	Config	Test1	Test2	Band Group
Propagation condition		1,2,3,4,5,6	AWGN		
SRS Config		1,2,4,5	SRSConf.1 <sup>Note6</sup>	SRSConf.3 <sup>Note6</sup>	
		3, 6	SRSConf.1 <sup>Note6</sup>	SRSConf.2 <sup>Note6</sup>	
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 $N_{oc}$ to be fulfilled.					
NOTE 3: SS-RSRP and $I_0$ 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	
	SRSConf.1	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 $N_{RB,c}$
	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:  $T_e$  Timing Error Limit

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

Table 4.4.1.1.5-5:  $T_q$  Maximum Autonomous Time Adjustment Step and  $T_p$  Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	$T_q$	$T_p$	Maximum Adjustment Rate
1	15	$6.0 \cdot 64 \cdot T_c$	$1.9 \cdot 64 \cdot T_c$	$6.6 \cdot 64 \cdot T_c$
	30	$6.0 \cdot 64 \cdot T_c$	$1.9 \cdot 64 \cdot T_c$	$6.6 \cdot 64 \cdot T_c$
	60	$6.0 \cdot 64 \cdot T_c$	$1.9 \cdot 64 \cdot T_c$	$6.6 \cdot 64 \cdot T_c$
NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [6].				

## 4.4.2 UE timer accuracy

## 4.4.3 Timing advance

### 4.4.3.0 Minimum 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	$\pm 256 T_c$	$\pm 256 T_c$	$\pm 128 T_c$	$\pm 32 T_c$

#### 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
	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 ( $T_A$ ) value during T1		31	$N_{TA,new} = N_{TA,old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command ( $T_A$ ) value during T2		39	For SCS = 15kHz, $N_{TA,new} = N_{TA,old} + 8192 \cdot T_c$ (based on equation in TS 38.213 [8] clause 4.2) For SCS = 30kHz, $N_{TA,new} = N_{TA,old} + 4096 \cdot T_c$ (based on equation in TS 38.213 [8] clause 4.2)
T1	S	5	
T2	S	5	

- 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.
- 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 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.

- 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.
- 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.
- SS shall transmit an RRCConnectionReconfiguration message.
- The UE shall transmit RRCConnectionReconfigurationComplete message.
- 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.
- 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.
- 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.
- 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 {				

Derivation Path: TS 38.508-1, Table 4.6.3-182

Information Element	Value/remark	Comment	Condition
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:

$$k = 5 \text{ for Config 1, 2, 3, 4, 5, 6}$$

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	
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52	
	Config 2,5		10: N <sub>RB,c</sub> = 52	
	Config 3,6		40: N <sub>RB,c</sub> = 106	
BWP BW	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52	
	Config 2,5		10: N <sub>RB,c</sub> = 52	
	Config 3,6		40: N <sub>RB,c</sub> = 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	

Parameter	Unit	Test1	
		T1	T2
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)			
$N_{oc}^{Note2}$	dBm/15kHz	-98	
$N_{oc}^{Note2}$	Config 1,2,4,5	-98	
	Config 3,6	-95	
$\hat{E}_s / I_{ot}$	dB	3	
$\hat{E}_s / N_{oc}$	dB	3	
$I_o^{Note3}$	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  $N_{oc}$  to be fulfilled.

NOTE 3:  $I_o$  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	Frequency hopping is disabled
	Config 3,6	
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	$\pm 344 T_c$	$\pm 344 T_c$	$\pm 216 T_c$



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  $Q_{out}$  and  $Q_{in}$  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  $T_{Evaluate\_out\_SSB}$  [ms] period becomes worse than the threshold  $Q_{out\_SSB}$  within  $T_{Evaluate\_out\_SSB}$  [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.

$T_{Evaluate\_out\_SSB}$  is defined in Table 4.5.1.0.1-1 for FR1.

**Table 4.5.1.0.1-1: Evaluation period  $T_{Evaluate\_out}$  for FR1**

Configuration	$T_{Evaluate\_out\_SSB}$ (ms)
no DRX	$\max(200, \text{ceil}(10 \cdot P) \cdot T_{SSB})$
DRX cycle $\leq 320$	$\max(200, \text{ceil}(15 \cdot P) \cdot \max(T_{DRX}, T_{SSB}))$
DRX cycle $> 320$	$\text{ceil}(10 \cdot P) \cdot T_{DRX}$
NOTE: $T_{SSB}$ is the periodicity of SSB configured for RLM. $T_{DRX}$ is the DRX cycle length	

For FR1,

- $P = 1 / (1 - T_{SSB} / MGRP)$ , 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,  $T_{SMTcperiod}$  follows *smtc2*; otherwise  $T_{SMTcperiod}$  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  $T_{\text{Evaluate\_out\_CSI-RS}}$  [ms] period becomes worse than the threshold  $Q_{\text{out\_CSI-RS}}$  within  $T_{\text{Evaluate\_out\_CSI-RS}}$  [ms] evaluation period.

- $T_{\text{Evaluate\_out\_CSI-RS}}$  is defined in Table 4.5.1.0.3-1 for FR1.

For FR1,

- $P=1/(1 - T_{\text{CSI-RS}}/M_{\text{GRP}})$ , 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  $M_{\text{out}}$  used in Table 4.5.1.0.3-1 is defined as:

- $M_{\text{out}} = 20$  if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth  $\geq 24$  PRBs.

**Table 4.5.1.0.3-1: Evaluation period  $T_{\text{Evaluate\_out\_CSI-RS}}$  for FR1**

Configuration	$T_{\text{Evaluate\_out\_CSI-RS}}$ (ms)
no DRX	$\max(200, \text{ceil}(M_{\text{out}} \times P) \times T_{\text{CSI-RS}})$
$\text{DRX} \leq 320\text{ms}$	$\max(200, \text{ceil}(1.5 \times M_{\text{out}} \times P) \times \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
$\text{DRX} > 320\text{ms}$	$\text{ceil}(M_{\text{out}} \times P) \times T_{\text{DRX}}$
NOTE: $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for $T_{\text{CSI-RS}}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $T_{\text{DRX}}$ 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  $Q_{out}$ , 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  $T_{indication\_interval}$ .

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

In case DRX is used,  $T_{indication\_interval}$  is  $\max(10\text{ms}, 1.5 \cdot DRX\_cycle\_length, 1.5 \cdot T_{RLM-RS,M})$  if  $DRX\_cycle\_length$  is less than or equal to 320ms, and  $T_{indication\_interval}$  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  $T_{evaluate\_in\_CSI-RS}$  [ms] period becomes better than the threshold  $Q_{in\_CSI-RS}$  within  $T_{evaluate\_in\_CSI-RS}$  [ms] evaluation period.

- $T_{\text{Evaluate\_in\_CSI-RS}}$  is defined in Table 8.1.3.2-1 for FR1.

For FR1,

- $P=1/(1 - T_{\text{CSI-RS}}/M_{\text{GRP}})$ , 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  $M_{\text{in}}$  used in Table 8.1.3.2-1 is defined as:

- $M_{\text{in}} = 10$ , if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth  $\geq 24$  PRBs.

**Table 8.1.3.2-1: Evaluation period  $T_{\text{Evaluate\_in\_CSI-RS}}$  for FR1**

Configuration	$T_{\text{Evaluate\_in\_CSI-RS}}$ (ms)
no DRX	$\max(100, \text{ceil}(M_{\text{in}} \times P) \times T_{\text{CSI-RS}})$
$\text{DRX} \leq 320\text{ms}$	$\max(100, \text{ceil}(1.5 \times M_{\text{in}} \times P) \times \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
$\text{DRX} > 320\text{ms}$	$\text{ceil}(M_{\text{in}} \times P) \times T_{\text{DRX}}$

NOTE:  $T_{\text{CSI-RS}}$  is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for  $T_{\text{CSI-RS}}$  equal to 5 ms, 10ms, 20 ms or 40 ms.  $T_{\text{DRX}}$  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  $Q_{in}$ , 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  $T_{\text{Indication\_interval}}$ .

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

In case DRX is used,  $T_{\text{Indication\_interval}}$  is  $\max(10\text{ms}, 1.5 \cdot \text{DRX\_cycle\_length}, 1.5 \cdot T_{\text{RLM-RS,M}})$  if DRX cycle\_length is less than or equal to 320ms, and  $T_{\text{Indication\_interval}}$  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.

#### 4.5.1.1 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.

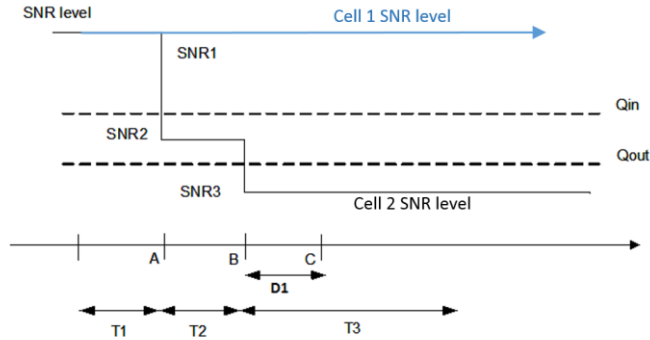


Figure 4.5.1.1.4.1: SNR variation for out-of-sync testing

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
	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
			<b>Test 1</b>
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
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 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
SMTTC Configuration	Config 1, 2, 4, 5		SMTTC.1
	Config 3, 6		SMTTC.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

Parameter	Unit	Value
		Test 1
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
$N_{oc}$	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.

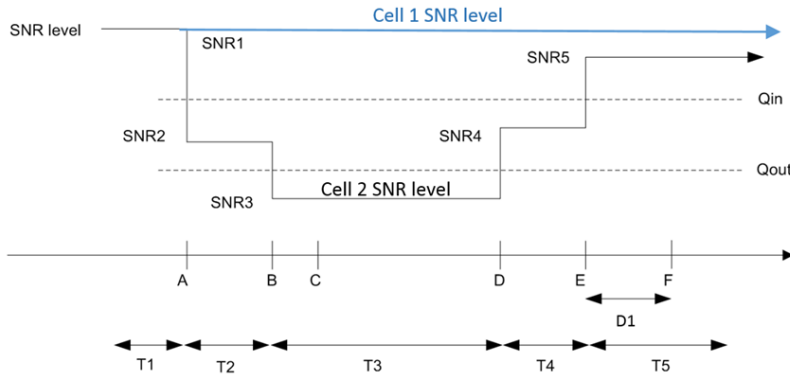


Figure 4.5.1.2.4-1: SNR variation for in-sync testing

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
	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	
BW <sub>channel</sub>	Config 1, 4	10: N <sub>RB,c</sub> = 52	
	Config 2, 5	10: N <sub>RB,c</sub> = 52	
	Config 3, 6	40: N <sub>RB,c</sub> = 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

Parameter	Unit	Value
		Test 1
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
		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
$N_{oc}$	Config 1, 4	dBm/1	-98				
	Config 2, 5	5 KHz	-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.

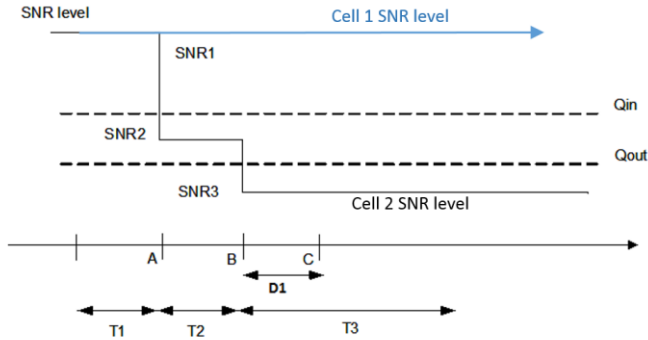


Figure 4.5.1.3.4-1: SNR variation for out-of-sync testing

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
	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
Active E-UTRA PCell			Test 1
E-UTRA RF Channel Number			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
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 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.

Parameter		Unit	Value
			Test 1
Layer 3 filtering			<i>Enabled</i>
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			0		
EPRE ratio of PBCH DMRS to SSS			0		
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PSS to SSS					
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					
SNR on RLM-RS	Config 1, 4		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	-98			

Parameter	Unit	Test 1		
		T1	T2	T3
$N_{oc}$	Config 2, 5	dBm/15		
	Config 3, 6	KHz		
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.

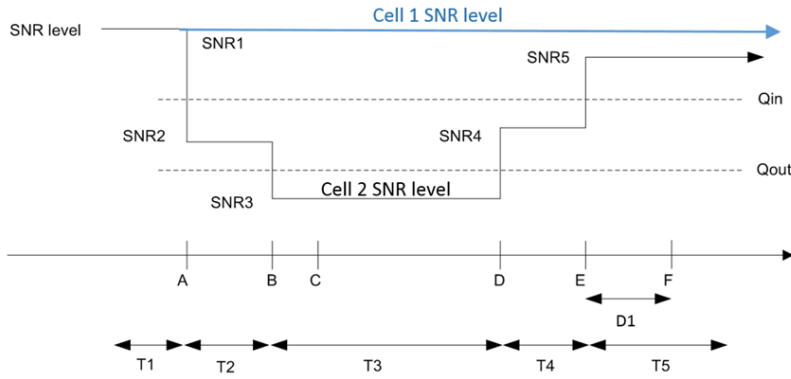


Figure 4.5.1.4.4-1 - SNR variation for in-sync testing

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
	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
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 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
SMTTC Configuration	Config 1, 2, 4, 5		SMTTC.1
	Config 3, 6		SMTTC.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
Out of sync transmission parameters	REG bundle size		6
	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8

Parameter		Unit	Value
			Test 1
	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
$N_{oc}$	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.

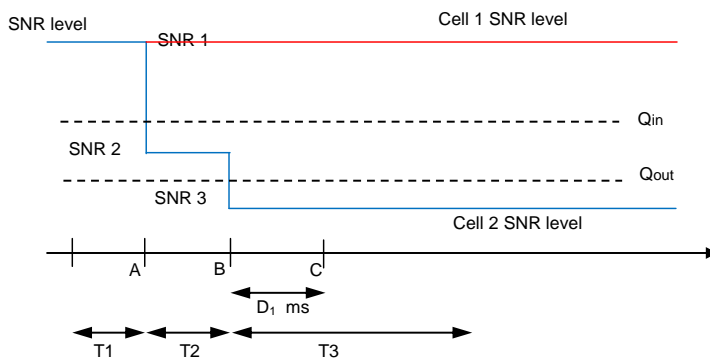
4.5.1.5.3 Minimum conformance requirements

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 DUT Part	A.3.1.7.1 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
Active E-UTRA PCell		Test 1 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	Config 1, 2, 3, 4, 5, 6	ULBWP.1.1

Parameter		Unit	Value
			Test 1
BWP configuration			
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
SMT-C Configuration	Config 1, 2, 4, 5		SMT-C.1
	Config 3, 6		SMT-C.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 PCell 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			
	Config 2, 5		1.8	-6.2	-15.8
	Config 3, 6		1.8	-6.2	-15.8
$N_{oc}$	Config 1, 4	dBm/15K	-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.

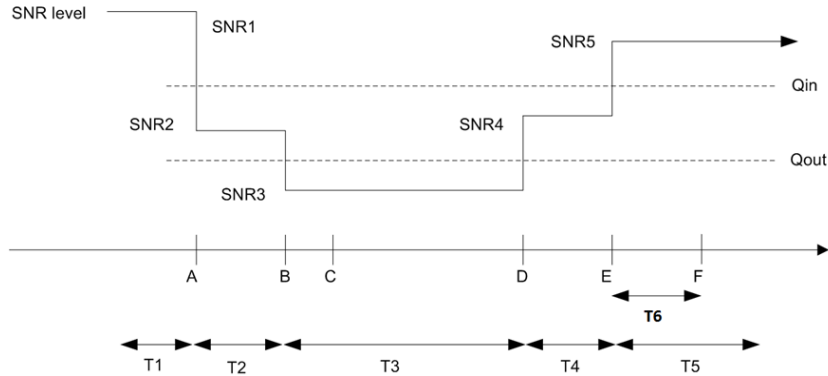


Figure 4.5.1.6.4.1: SNR variation for In-sync testing

#### 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.

Configure 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
	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
SMTTC Configuration	Config 1, 2, 4, 5		SMTTC.1
	Config 3, 6		SMTTC.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



Parameter		Unit	Value
			Test 1
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					
	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
$N_{oc}$	Config 1, 4	dBm/15KHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
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.

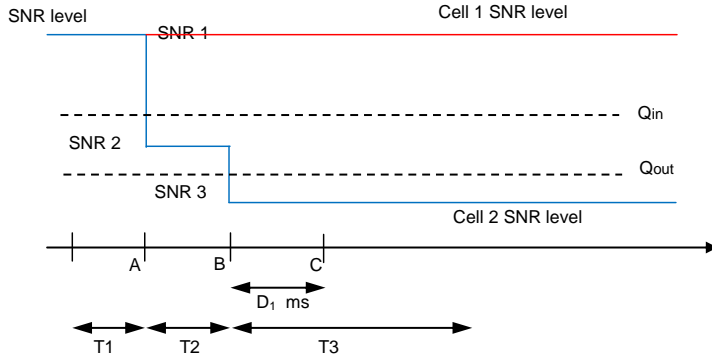


Figure 4.5.1.7.4-1: SNR variation for out-of-sync testing

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.

Configure 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
	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
			<b>Test 1</b>
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

Parameter		Unit	Value
			Test 1
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	1.8	-6.2	-15.8
	Config 2, 5	1.8	-6.2	-15.8
	Config 3, 6	1.8	-6.2	-15.8
$N_{oc}$	Config 1, 4	-98		
	Config 2, 5	-98		
	Config 3, 6	-98		

Parameter	Unit	Test 1		
		T1	T2	T3
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.



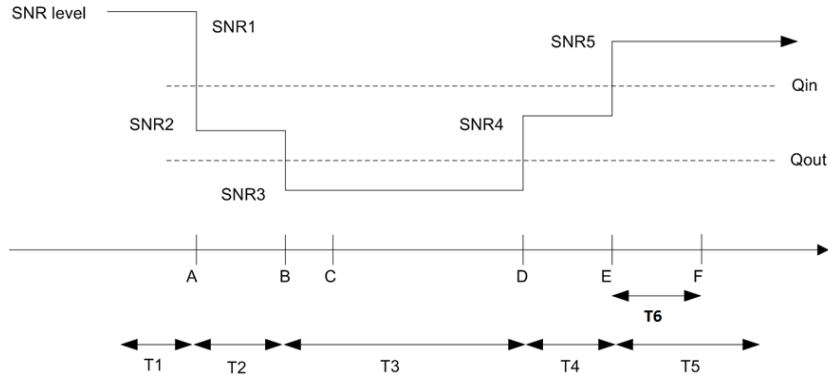


Figure 4.5.1.8.4-1: SNR variation for In-sync testing

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.

Configure 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 DUT Part: A.3.2.3.4	As specified in TS 38.508-1 [14] Annex A.
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

Parameter		Unit	Value
			Test 1
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			<i>gp0</i>
Layer 3 filtering			<i>Enabled</i>
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					
	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
$N_{oc}$	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%.

## 4.5.2 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 during 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 8.2.1.2.1-1.

Each interruption shall not exceed X slot as defined in table 8.2.1.2.1-1.

**Table 8.2.1.2.1-1: Interruption length X at transition between active and non-active during DRX**

$\mu$	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 8.2.2.2.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 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 8.2.2.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

**Table 8.2.2.2.2-1: Interruption duration for SCell activation/deactivation for inter-band CA**

$\mu$	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1
2	0.25	2
3	0.125	4

**Table 8.2.2.2.2-2: Interruption duration for SCell activation/deactivation for intra-band CA**

$\mu$	NR Slot length (ms)	Interruption length
0	1	$1 + T_{\text{SMTC\_duration}}$
1	0.5	$1 + T_{\text{SMTC\_duration}}$
2	0.25	$2 + T_{\text{SMTC\_duration}}$
3	0.125	$4 + T_{\text{SMTC\_duration}}$

NOTE:  $T_{\text{SMTC\_duration}}$  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 SCells is 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 8.2.1.2.5-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC**

$\mu$	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.

#### 4.5.2.1 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
	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
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 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

Parameter		Unit	Cell 2
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)			
$N_{oc}$ <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
$\bar{E}_s/I_{ot}$		dB	17
$\bar{E}_s/N_{oc}$		dB	17
$I_o$ <sup>Note 3</sup>	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to cell1 <sup>Note 4</sup>		$\mu$ s	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 $N_{oc}$ to be fulfilled.			
NOTE 3: SS-RSRP and $I_o$ 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**

$\mu$	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:
    - $X = \text{interruption length} + k1$  if  $k1 \leq \text{interruption length}$ , otherwise  $X = \text{interruption length}$ .
  - For test configuration other than 4.5.2.2-1 and 4.5.2.2-4:
    - $X = \text{interruption length}$ .
  - 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
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 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
SMTTC Configuration			SMTTC.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			

Parameter		Unit	Cell 2
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)			
$N_{oc}$ Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$E_s/I_{ot}$		dB	17
$E_s/N_{oc}$		dB	17
$N_{oc}$ Note 2	Config 1,2,4,5	-104	-104
	Config 3,6		-101
$I_o$ Note 3	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		500
	Config 3,6	$\mu$ s	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 $N_{oc}$ to be fulfilled.			
NOTE 3: SS-RSRP and $I_o$ 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**

$\mu$	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, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.2.3-2	LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.2.3-3	LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode
4.5.2.3-4	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.2.3-5	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.2.3-6	LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ 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  $\geq$  the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration.

**Table 4.5.2.3.4.1-1A: Supported test configurations for NR SCell**

Config <sub>SCell</sub>	Description
4.5.2.3-1	NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.2.3-2	NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.2.3-3	NR 30 kHz SSB SCS, $\geq 40$ 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  $\geq$  the bandwidth ( $BW_{\text{channel}}$ ) 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
	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  $k1 \leq$  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
$BW_{\text{channel}}$			Note 8
$BW_{\text{occupied}}$	Config 1,2,4,5	RB	52 <sup>Note 6</sup>
	Config 3,6		106 <sup>Note 7</sup>
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 <sup>Note 6</sup>
	Config 3,6		OP.1 <sup>Note 7</sup>
SMTTC Configuration			SMTTC.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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
$N_{\text{oc}}$ <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
$\bar{E}_s/I_{\text{ot}}$		dB	17
$\bar{E}_s/N_{\text{oc}}$		dB	17
$I_{\text{o}}$ <sup>Note 3</sup>	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.86
Time offset to Cell1 <sup>Note 4</sup>		$\mu\text{s}$	3 for intra-band EN-DC, 33 for inter-band EN-DC
Time offset to Cell2 <sup>Note 5</sup>		$\mu\text{s}$	-
Propagation Condition			AWGN

Parameter	Unit	Cell 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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .		
NOTE 3: SS-RSRP and $l_0$ 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $l_0$ is independent of the $BW_{channel}$ configured.		
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $l_0$ is independent of the $BW_{channel}$ configured.		
Note 8: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .		

**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	Config <sub>SCell</sub> 1	FDD
	Config <sub>SCell</sub> 2,3	TDD
TDD configuration	Config <sub>SCell</sub> 1	Not Applicable
	Config <sub>SCell</sub> 2	TDDConf.1.1
	Config <sub>SCell</sub> 3	TDDConf.2.1
$BW_{channel}$		Note 8
$BW_{occupied}$	Config <sub>SCell</sub> 1,2	52 <sup>Note 6</sup>
	Config <sub>SCell</sub> 3	106 <sup>Note 7</sup>
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	Config <sub>SCell</sub> 1	CR.1.1 FDD
	Config <sub>SCell</sub> 2	CR.1.1 TDD
	Config <sub>SCell</sub> 3	CR.2.1 TDD
PDCCH CORESET parameters	Config <sub>SCell</sub> 1	CCR.1.1 FDD
	Config <sub>SCell</sub> 2	CCR.1.1 TDD
	Config <sub>SCell</sub> 3	CCR.2.1 TDD
TRS configuration	Config <sub>SCell</sub> 1	TRS.1.1 FDD
	Config <sub>SCell</sub> 2	TRS.1.1 TDD
	Config <sub>SCell</sub> 3	TRS.1.2 TDD
OCNG Patterns	Config <sub>SCell</sub> 1,2	OP.1 <sup>Note 6</sup>
	Config <sub>SCell</sub> 3	OP.1 <sup>Note 7</sup>
SMTc Configuration		SMTc.1
TCI state		TCI.State.0
SSB Configuration	Config <sub>SCell</sub> 1,2	SSB.1 FR1
	Config <sub>SCell</sub> 3	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		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>		
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>		
$N_{oc}$ <sup>Note 2</sup>	dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>	dBm/15 kHz	-87
$\bar{E}_s/l_{ot}$	dB	17

Parameter	Unit	Cell 3
$\bar{E}_s/N_{oc}$	dB	17
$I_o$ <sup>Note 3</sup>	Config <sub>SCell</sub> 1,2	dBm/9.36MHz
	Config <sub>SCell</sub> 3	dBm/38.16MHz
Time offset to Cell1 <sup>Note 4</sup>	$\mu$ s	3 + Time offset to Cell2 for intra-band EN-DC, 33 + Time offset to Cell2 for inter-band EN-DC
Time offset to Cell2 <sup>Note 5</sup>	$\mu$ s	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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .		
NOTE 3: SS-RSRP and $I_o$ 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.		
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.		
Note 8: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .		

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**

$\mu$	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**

$\mu$	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, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.2.4-2	LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.2.4-3	LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode
4.5.2.4-4	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.2.4-5	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.2.4-6	LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ 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  $\geq$  the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration

**Table 4.5.2.4.4.1-1A: Supported test configurations for NR SCell**

Config <sub>SCell</sub>	Description
1	NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, $\geq 40$ 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  $\geq$  the bandwidth ( $BW_{\text{channel}}$ ) 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 SCCells 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  $k1 \leq$  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	MeasObjectld 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
BW <sub>channel</sub>			Note 8
BW <sub>occupied</sub>	Config 1,2,4,5	RB	52 <sup>Note 6</sup>
	Config 3,6		106 <sup>Note 7</sup>
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 <sup>Note 6</sup>

Parameter	Unit	Cell 2	
	Config 3,6	OP.1 <sup>Note 7</sup>	
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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
$N_{oc}$ <sup>Note 2</sup>	dBm/15 kHz	-104	
SS-RSRP <sup>Note 3</sup>	dBm/15 kHz	-87	
$\bar{E}_s/I_{ot}$	dB	17	
$\bar{E}_s/N_{oc}$	dB	17	
$I_{o}$ <sup>Note 3</sup>	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.86
Time offset to Cell1 <sup>Note 4</sup>	Config 1,2,4,5	$\mu$ s	500
	Config 3,6	$\mu$ s	250
Time offset to Cell2 <sup>Note 5</sup>		$\mu$ s	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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .			
NOTE 3: SS-RSRP and $I_o$ 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.			
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.			
Note 8: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .			

**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	Config <sub>SCell</sub> 1	FDD
	Config <sub>SCell</sub> 2,3	TDD
TDD configuration	Config <sub>SCell</sub> 1	Not Applicable
	Config <sub>SCell</sub> 2	TDDConf.1.1
	Config <sub>SCell</sub> 3	TDDConf.2.1
$BW_{channel}$		Note 8
$BW_{occupied}$	Config <sub>SCell</sub> 1,2	52 <sup>Note 6</sup>
	Config <sub>SCell</sub> 3	106 <sup>Note 7</sup>
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	Config <sub>SCell</sub> 1	CR.1.1 FDD
	Config <sub>SCell</sub> 2	CR.1.1 TDD
	Config <sub>SCell</sub> 3	CR.2.1 TDD

Parameter		Unit	Cell 3
PDCCH CORESET parameters	Config <sub>SCell</sub> 1		CCR.1.1 FDD
	Config <sub>SCell</sub> 2		CCR.1.1 TDD
	Config <sub>SCell</sub> 3		CCR.2.1 TDD
TRS configuration	Config <sub>SCell</sub> 1		TRS.1.1 FDD
	Config <sub>SCell</sub> 2		TRS.1.1 TDD
	Config <sub>SCell</sub> 3		TRS.1.2 TDD
OCNG Patterns	Config <sub>SCell</sub> 1,2		OP.1 <sup>Note 6</sup>
	Config <sub>SCell</sub> 3		OP.1 <sup>Note 7</sup>
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config <sub>SCell</sub> 1,2		SSB.1 FR1
	Config <sub>SCell</sub> 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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
N <sub>oc</sub> <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
$\bar{E}_s/I_{ot}$		dB	17
$\bar{E}_s/N_{oc}$		dB	17
I <sub>o</sub> <sup>Note 3</sup>	Config <sub>SCell</sub> 1,2	dBm/9.36MHz	-58.96
	Config <sub>SCell</sub> 3	dBm/38.16MHz	-52.86
Time offset to Cell1 <sup>Note 4</sup>	Config <sub>SCell</sub> 1,2	$\mu$ s	500 + Time offset to Cell2
	Config <sub>SCell</sub> 3		250 + Time offset to Cell2
Time offset to Cell2 <sup>Note 5</sup>		$\mu$ s	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 N <sub>oc</sub> to be fulfilled within BW <sub>occupied</sub> .			
NOTE 3: SS-RSRP and I <sub>o</sub> 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 BW <sub>occupied</sub> (i.e. 10 MHz, 52 RBs) from F <sub>C,low</sub> , and I <sub>o</sub> is independent of the BW <sub>channel</sub> configured.			
Note 7: All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106 RBs) from F <sub>C,low</sub> , and I <sub>o</sub> is independent of the BW <sub>channel</sub> configured.			
Note 8: N <sub>RB,c</sub> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .			

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**

$\mu$	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**

$\mu$	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 <sup>Note 2</sup>	
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 SCCell 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 SCCell, 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 SCCell		Cell3	Deactivated SCCell on E-UTRAN RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCCell measurement cycle (measCycleSCCell)	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,
    - $Z = \text{interruption length} + k1$  if  $k1 \leq \text{interruption length}$ , otherwise  $Z = \text{interruption length}$
  - 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.
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	
Specific message contents exceptions for Test Configuration 4.5.2.5-1, 4.5.2.5-2, 4.5.2.5-4 and 4.5.2.5-5	Table H.3.1-3 with Condition INTRA-FREQ MO 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 4.5.2.5-3 and 4.5.2.5-6	Table H.3.1-3 with Condition INTRA-FREQ MO and SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

**Table 4.5.2.5.4.3-2: MeasObjectEUTRA for E-UTRA deactivated SCell**

Derivation Path: 36.508 Table 4.6.6-2			
Information Element	Value/remark	Comment	Condition
MeasObjectEUTRA ::= SEQUENCE {			
carrierFreq	Downlink EARFCN for E-UTRAN SCell		
measCycleSCell-r10	sf640		
}			

**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
---

#### 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
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 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

Parameter		Unit	Cell 2
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)			
$N_{oc}$ <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
$\bar{E}_s/I_{ot}$		dB	17
$\bar{E}_s/N_{oc}$		dB	17
$I_o$ <sup>Note 3</sup>	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to Cell1 <sup>Note 4</sup>		$\mu$ s	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 $N_{oc}$ to be fulfilled.			
NOTE 3: SS-RSRP and $I_o$ 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**

$\mu$	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 <sup>Note 2</sup>
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 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 4.5.2.6-1 and 4.5.2.6-4,
    - Z = interruption length + k1 if  $k1 \leq$  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.
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	
Specific message contents exceptions for Test Configuration 4.5.2.6-1, 4.5.2.6-2, 4.5.2.6-4 and 4.5.2.6-5	Table H.3.1-3 with Condition INTRA-FREQ MO 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 4.5.2.6-3 and 4.5.2.6-6	Table H.3.1-3 with Condition INTRA-FREQ MO and SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.2.6.4.3-2: MeasObjectEUTRA for E-UTRAN deactivated SCell

Derivation Path: 36.508 Table 4.6.6-2			
Information Element	Value/remark	Comment	Condition
MeasObjectEUTRA ::= SEQUENCE { carrierFreq	Downlink EARFCN for E-UTRAN SCell		
measCycleSCell-r10	sf640		
}			

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			
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## 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
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 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
SMTTC Configuration			SMTTC.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

Parameter		Unit	Cell 2
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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
$N_{oc}$ <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
$\bar{E}_s/lot$		dB	17
$\bar{E}_s/N_{oc}$		dB	17
$I_o$ <sup>Note 3</sup>	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to Cell1 <sup>Note 4</sup>	Config 1,2,4,5	$\mu$ s	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 $N_{oc}$ to be fulfilled.			
NOTE 3: SS-RSRP and $I_o$ 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**

$\mu$	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**

$\mu$	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%.

## 4.5.3 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  $n +$

$\frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$ , where:

$T_{\text{HARQ}}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in 38.213 [8].

$T_{\text{activation\_time}}$  is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1,  $T_{\text{activation\_time}}$  is:

- $T_{\text{FirstSSB}} + 5\text{ms}$ , if the SCell measurement cycle is equal to or smaller than 160ms.
- $T_{\text{FirstSSB\_MAX}} + T_{\text{rs}} + 5\text{ms}$ , if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition  $\hat{E}_s/\text{Tot} \geq -2\text{dB}$  is fulfilled,  $T_{\text{activation\_time}}$  is:

- $T_{\text{FirstSSB\_MAX}} + T_{\text{SMTc\_MAX}} + 2 * T_{\text{rs}} + 5\text{ms}$ .

If the SCell being activated belongs to FR2, and if there is at least one active serving cell on that FR2 band, then  $T_{\text{activation\_time}}$  is  $T_{\text{FirstSSB}} + 5\text{ms}$  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,  $T_{\text{activation\_time}}$  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  $T_{\text{activation\_time}}$  is:

- $3\text{ms} + \max(T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}} + 2\text{ms}, T_{\text{uncertainty\_SP}})$ , where  $T_{\text{uncertainty\_MAC}}=0$  and  $T_{\text{uncertainty\_SP}}=0$ , 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  $T_{\text{activation\_time}}$  is:

- $\max(T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}, T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay-THARQ}})$ , where  $T_{\text{uncertainty\_MAC}}=0$  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  $\hat{E}_s/\text{Tot} \geq -2\text{dB}$  is fulfilled, then  $T_{\text{activation\_time}}$  is:

- $6\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTC\_MAX}} + 8 * T_{\text{TS}} + T_{\text{L1-RSRP\_measure}} + T_{\text{L1-RSRP\_report}} + T_{\text{HARQ}} + \max(T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}} + 2\text{ms}, T_{\text{uncertainty\_SP}})$

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  $\hat{E}_s/\text{Tot} \geq -2\text{dB}$  is fulfilled, then  $T_{\text{activation\_time}}$  is:

- $3\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTC\_MAX}} + 8 * T_{\text{TS}} + T_{\text{L1-RSRP\_measure}} + T_{\text{L1-RSRP\_report}} + \max((T_{\text{HARQ}} + T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}), (T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay}}))$ .

Where,

$T_{\text{SMTC\_MAX}}$ :

- In FR1, in case of intra-band SCell activation,  $T_{\text{SMTC\_MAX}}$  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,  $T_{\text{SMTC\_MAX}}$  is the SMTC periodicity of SCell being activated.
- In FR2,  $T_{\text{SMTC\_MAX}}$  is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.
- $T_{\text{SMTC\_MAX}}$  is bounded to a minimum value of 10ms.

$T_{\text{TS}}$  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  $T_{\text{TS}}$  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  $T_{\text{TS}}$  is applied with  $T_{\text{TS}} = 5\text{ms}$  assuming the SSB transmission periodicity is 5ms. There is no requirements if the SSB transmission periodicity is not 5ms.

$T_{\text{FirstSSB}}$ : 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  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ .

$T_{\text{FirstSSB\_MAX}}$ : 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  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , 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.

$T_{\text{FineTiming}}$  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

$T_{\text{L1-RSRP\_measure}}$  is L1-RSRP measurement delay  $T_{\text{L1-RSRP\_Measurement\_Period\_SSB}}$  ms or  $T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$  based on applicability as defined in TS 38.133 [6] clause 9.5 assuming  $M=1$ .

$T_{\text{L1-RSRP\_report}}$  is delay of acquiring CSI reporting resources.

$T_{\text{uncertainty\_MAC}}$  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.

$T_{\text{uncertainty\_SP}}$  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.

$T_{\text{uncertainty\_RRC}}$  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.

$T_{\text{RRC\_delay}}$  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.  $T_{\text{CSI\_reporting}}$  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  $\max(5 \text{ measCycleSCell}, 5 \text{ DRX cycles})$  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  $\max(5 \text{ measCycleSCell}, 5 \text{ DRX cycles})$  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 class 1 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,  $T_{\text{SMTc\_Scell}}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated.  $T_{\text{SMTc\_MAX}}$  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  $n+1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  and not occur after slot  $n+1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{NR slot length}}$ , where NR slot length is with respect to the numerology used in the SCell being activated, and  $T_X$  is:

- $T_{\text{FirstSSB}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FirstSSB}}$ ;
- $T_{\text{FirstSSB\_MAX}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FirstSSB\_MAX}}$ ;
- $T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FineTiming}}$ .

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 requirements 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  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ .

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  $n+1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  and not occur after slot  $n+1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , 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  $n + \frac{3\text{ms}}{\text{NR slot length}}$ . 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  $n+1 + \frac{3\text{ms}}{\text{NR slot length}}$ , 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, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.3.1-2	LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.3.1-3	LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode
4.5.3.1-4	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.3.1-5	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.3.1-6	LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ 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 $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration.	

**Table 4.5.3.1.4.1-1A: supported test configurations for NR SCell**

Config <sub>scell</sub>	Description
1	NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, $\geq 40$ 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 $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) 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
	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.
T <sub>HARQ</sub>	ms	$k_1 \cdot \text{NR slot length}$	$k_1$ 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]
T <sub>CSI_Reporting</sub>	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	$k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}, \mu} + 1$	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  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$ . 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  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{NR slot length}} + N_{\text{interruption}}$ . Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe  $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$  to subframe  $m_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$ , where  $m_1$  and  $m_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $m$ , and  $N_{\text{interruption}}$  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  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ . The starting point of any PSCell interruption due to the deactivation shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ . The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe  $n_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA subframe length}}$  to subframe  $n_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{EUTRA subframe length}}$ , where  $n_1$  and  $n_2$  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  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{(CSI_Reporting)}}}{\text{NR slot length}}$ ,
  - or slot  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{(CSI_Reporting)}} + T_X}{\text{NR slot length}} + N_{\text{interruption}} + 1$  if the slot  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{(CSI_Reporting)}}}{\text{NR slot length}}$  was subject to interruption,
  - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI_Reporting}}}{\text{NR slot length}}$ ,
  - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI_Reporting}}}{\text{NR slot length}}$
  - and DTX is not observed by the SS outside the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{NR slot length}} + N_{\text{interruption}} + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  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  $n + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$
  - and DTX is not observed by the SS outside the slot  $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $n + 1 + \frac{T_{HARQ} + 3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$  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 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		
$BW_{channel}$		MHz	Note 7		
$BW_{occupied}$	Config 1,2,4,5	RB	52 <sup>Note 5</sup>		
	Config 3,6		106 <sup>Note 6</sup>		
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 <sup>Note 5</sup>		
	Config 3,6		OP.1 <sup>Note 6</sup>		
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 <sup>Note 1</sup>					
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>					
$N_{oc}$ <sup>Note 2</sup>		dBm/15kHz	-104		
$N_{oc}$ <sup>Note 2</sup>	Config 1,2,4,5	dBm/SCS	-104		
	Config 3,6		-101		
$\hat{E}_s/I_{ot}$		dB	17		

$\hat{E}_s / N_{oc}$		dB	17
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5	dBm/SCS	-87
	Config 3,6		-84
SCH_RP <sup>Note3</sup>		dBm/15 kHz	-87
I <sub>0</sub> <sup>Note3</sup>	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.87
Propagation condition		-	AWGN
<p>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.</p> <p>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 <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>NOTE 3: SS-RSRP, I<sub>0</sub> and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]</p> <p>NOTE 5: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and I<sub>0</sub> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 6: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and I<sub>0</sub> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 7: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p>			

**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	Config <sub>SCell</sub> 1		FDD		
	Config <sub>SCell</sub> 2,3		TDD		
TDD configuration	Config <sub>SCell</sub> 1		Not Applicable		
	Config <sub>SCell</sub> 2		TDDConf.1.1		
	Config <sub>SCell</sub> 3		TDDConf.2.1		
BW <sub>channel</sub>		MHz	Note 7		
BW <sub>occupied</sub>	Config <sub>SCell</sub> 1,2	RB	52 Note 5		
	Config <sub>SCell</sub> 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	Config <sub>SCell</sub> 1		SR.1.1 FDD		
	Config <sub>SCell</sub> 2		SR.1.1 TDD		
	Config <sub>SCell</sub> 3		SR.2.1 TDD		
RMSI CORESET Reference Channel	Config <sub>SCell</sub> 1		CR.1.1 FDD		
	Config <sub>SCell</sub> 2		CR.1.1 TDD		
	Config <sub>SCell</sub> 3		CR.2.1 TDD		
RMC CORESET Reference Channel	Config <sub>SCell</sub> 1		CCR.1.1 FDD		
	Config <sub>SCell</sub> 2		CCR.1.1 TDD		
	Config <sub>SCell</sub> 3		CCR.2.1 TDD		
TRS configuration	Config <sub>SCell</sub> 1		TRS.1.1 FDD		
	Config <sub>SCell</sub> 2		TRS.1.1 TDD		
	Config <sub>SCell</sub> 3		TRS.1.2 TDD		
OCNG Patterns	Config <sub>SCell</sub> 1,2		OP.1 Note 5		
	Config <sub>SCell</sub> 3		OP.1 Note 6		
SMTC configuration			SMTC.1		
SSB configuration	Config <sub>SCell</sub> 1,2		SSB.1 FR1		
	Config <sub>SCell</sub> 3		SSB.2 FR1		
CSI-RS configuration for CSI reporting	Config <sub>SCell</sub> 1		CSI-RS.1.1 FDD		
	Config <sub>SCell</sub> 2		CSI-RS.1.1 TDD		
	Config <sub>SCell</sub> 3		CSI-RS.2.1 TDD		
PDSCH/PDCCH subcarrier spacing	Config <sub>SCell</sub> 1,2	kHz	15		
	Config <sub>SCell</sub> 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 <sup>Note1</sup>					
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>					
$N_{oc}$ <sup>Note2</sup>		dBm/15kHz	-104		
$N_{oc}$ <sup>Note2</sup>	Config <sub>SCell</sub> 1,2	dBm/SCS	-104		
	Config <sub>SCell</sub> 3		-101		
$\hat{E}_s/I_{ot}$		dB	17		
$\hat{E}_s/N_{oc}$		dB	17		
SS-RSRP <sup>Note3</sup>	Config <sub>SCell</sub> 1,2	dBm/SCS	-87		
	Config <sub>SCell</sub> 3		-84		

SCH_RP <small>Note 3</small>		dBm/15 kHz	-87
I <sub>0</sub> <small>Note 3</small>	Config <sub>SCell</sub> 1,2	dBm/9.36MHz	-58.96
	Config <sub>SCell</sub> 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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .			
NOTE 3: SS-RSRP, I <sub>0</sub> 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and I <sub>0</sub> is independent of the $BW_{channel}$ configured.			
NOTE 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and I <sub>0</sub> is independent of the $BW_{channel}$ configured.			
NOTE 7: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .			

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  $m + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$ . 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  $m + 1 + \frac{T_{HARQ} + 3ms + T_{CSI\ Reporting}}{NR\ slot\ length}$  was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot  $m + 1 + \frac{T_{HARQ} + 3ms + T_{CSI\ Reporting}}{NR\ slot\ length}$ .

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $m + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\ Reporting}}{NR\ slot\ length}$ ,  $T_{activation\_time} = T_{FirstSSB} + 5ms$ , as defined in TS 38.133 [6] section 8.3.

Figures 4.5.3.1.5-1 shows the derivation of the Test procedure requirement for DTX during T2, based on the core requirements for interruption.

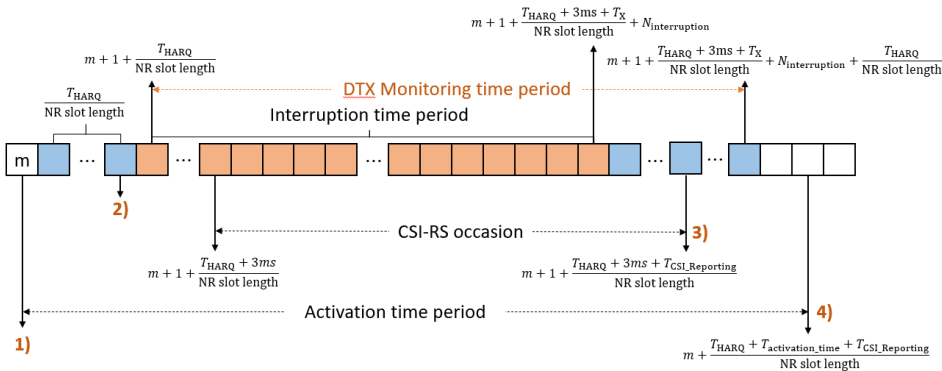


Figure 4.5.3.1.5-1: Procedure derivation for Activation

- 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  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell during SCell activation shall not happen outside the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{NR slot length}} + N_{\text{interruption}}$ , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe  $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$  to subframe  $m_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$ , as defined in TS 38.133 [6] section 8.3.

During T3 the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , 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  $n_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA subframe length}}$  to subframe  $n_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{EUTRA subframe length}}$ .

Figures 4.5.3.1.5-2 shows the derivation of the Test procedure requirement for NR PCell DTX during T3, based on the core requirements for interruption.

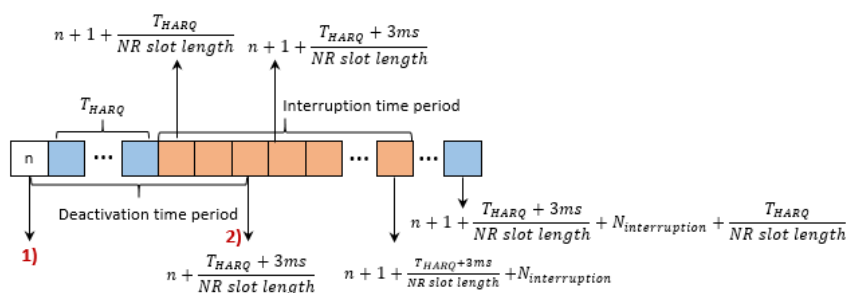


Figure 4.5.3.1.5-2: Procedure derivation for Deactivation

- 1) Deactivation command for SCell
- 2) Latest slot stop sending CSI reports for SCell

The interruption of PCell 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  $m + \frac{T_{\text{HARQ}} + T_{\text{activation time}} + T_{\text{CSI Reporting}}}{\text{NR slot length}}$  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  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{FirstSSB\_MAX}} + T_{\text{IS}} + 5\text{ms}$ .

## 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 3 and step 5 are replaced by following steps:

- 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.
- 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 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  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{FirstSSB\_MAX}} + T_{\text{SMTC\_MAX}} + 2 \cdot T_{\text{TS}} + 5\text{ms}$

### 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  $T_{UL\_carrier\_config}$  from the end of the slot  $n$ .

Where

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL\_carrier\_deconfig}$  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  $T_{UL\_carrier\_config}$  from the end of slot  $n$ .

Where

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL\_carrier\_deconfig}$  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, $\geq 10$ MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode
4.5.4.1-2	15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode
4.5.4.1-3	15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode
4.5.4.1-4	15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode

Configuration	PSCell (Cell2)	SCell (Cell3)
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 ( $BW_{channel}$ ) 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	

Parameter	Unit	Test configuration	Value	Comment
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		
BW <sub>channel</sub>	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		
BW <sub>occupied</sub>	RB	Conf 1, 2, 3	52 <sup>Note 4</sup>			52 <sup>Note 4</sup>		
		Conf 4, 5, 6	52 <sup>Note 4</sup>			52 <sup>Note 4</sup>		
		Conf 7, 8, 9	106 <sup>Note 5</sup>			106 <sup>Note 5</sup>		
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		

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
OCNG Pattern <sup>Note 1</sup>		Conf 1, 2, 3, 4, 5, 6	OP.1 <sup>Note 4</sup>			OP.1 <sup>Note 4</sup>		
		Conf 7, 8, 9	OP.1 <sup>Note 5</sup>			OP.1 <sup>Note 5</sup>		
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								
$N_{oc}$ <sup>Note 2</sup>	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102			-102		
		Conf 1,2,3,4,5,6 Conf 7,8,9	-102 -99			-102 -99		
$\hat{E}_s / N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_s / I_{ot}$ <sup>Note 3</sup>	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP <sup>Note 3</sup>	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
I <sub>o</sub> <sup>Note 3</sup>	dBm/9.36 MHz	Conf 1,2,3,4,5,6	-57.94	-57.94	-57.94	-57.94	-57.94	-57.94
		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		

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .								
NOTE 3: $\hat{E}_s/I_{ot}$ , $I_o$ , 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{c,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.								
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{c,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.								
NOTE 6: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .								

**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		
$BW_{channel}$	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		
$BW_{occupied}$	RB	Conf 1, 4, 7	52 <sup>Note 4</sup>			52 <sup>Note 4</sup>		
		Conf 2, 5, 8	52 <sup>Note 4</sup>			52 <sup>Note 4</sup>		
		Conf 3, 6, 9	106 <sup>Note 5</sup>			106 <sup>Note 5</sup>		
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]

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
		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 <sup>Note 1</sup>		Conf 1, 2, 4, 5, 7, 8	OP.1 <sup>Note 4</sup>			OP.1 <sup>Note 4</sup>		
		Conf 3, 6, 9	OP.1 <sup>Note 5</sup>			OP.1 <sup>Note 5</sup>		
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								



Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
$N_{oc}$ 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		
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_s/I_{ot}$ 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
$I_o$ 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/38.16M Hz	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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .								
NOTE 3: $\hat{E}_s/I_{ot}$ , $I_o$ , 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.								
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.								
NOTE 6: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .								

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  $\bar{q}_0$  estimated over the last  $T_{Evaluate\_BFD\_SSB}$  ms period becomes worse than the threshold  $Q_{out\_LR\_SSB}$  within  $T_{Evaluate\_BFD\_SSB}$  ms period.

The value of  $T_{\text{Evaluate\_BFD\_SSB}}$  is defined in Table 4.5.5.0.1-1 for FR1.

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{\text{MRGP}}}$ , 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 previous conditions.

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

**Table 4.5.5.0.1-1: Evaluation period  $T_{\text{Evaluate\_BFD\_SSB}}$  for FR1**

Configuration	$T_{\text{Evaluate\_BFD\_SSB}}$ (ms)
no DRX	$\text{Max}(50, \text{Ceil}(5 \times P) \times T_{\text{SSB}})$
DRX cycle $\leq 320$ ms	$\text{Max}(50, \text{Ceil}(7.5 \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$
DRX cycle $> 320$ ms	$\text{Ceil}(5 \times P) \times T_{\text{DRX}}$
NOTE: $T_{\text{SSB}}$ is the periodicity of SSB in the set $\bar{q}_0$ . $T_{\text{DRX}}$ 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  $\bar{q}_0$  estimated over the last  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  ms period becomes worse than the threshold  $Q_{\text{out\_LR\_CSI-RS}}$  within  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  ms period.

The value of  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  is defined in Table 4.5.5.0.2-1 for FR1.

For FR1:

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MRGP}}}$ , 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 previous conditions.

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

The values of  $M_{\text{BFD}}$  used in Table 4.5.5.0.2-1 is defined as:

- $M_{\text{BFD}} = 10$ , if the CSI-RS resource(s) in set  $\bar{q}_0$  used for BFD is transmitted with Density = 3 and over the bandwidth  $\geq 24$  PRBs.

The values of  $P_{\text{BFD}}$  used in Table 4.5.5.0.2-1 is defined as:

For each CSI-RS resource in the set  $\bar{q}_0$  configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{\text{BFD}} = 1$ ,

For each CSI-RS resource in the set  $\bar{q}_0$  configured for PSCell in NR-DC

$P_{\text{BFD}} = 2$  if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set  $\bar{q}_0$  configured for a SCell

- $P_{\text{BFD}} = Z$  in EN-DC or NE-DC or SA.
- $P_{\text{BFD}} = 2 * Z$  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  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  for FR1**

Configuration	$T_{\text{Evaluate\_BFD\_CSI-RS}}$ (ms)
no DRX	$\text{Max}(50, \text{Ceil}(M_{\text{BFD}} \times P \times P_{\text{BFD}}) \times T_{\text{CSI-RS}})$
DRX cycle $\leq 320$ ms	$\text{Max}(50, \text{Ceil}(1.5 \times M_{\text{BFD}} \times P \times P_{\text{BFD}}) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $> 320$ ms	$\text{Ceil}(M_{\text{BFD}} \times P \times P_{\text{BFD}}) \times T_{\text{DRX}}$
NOTE:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$ . $T_{\text{DRX}}$ 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  $Q_{out,LR}$ , and the index  $q_{new}$  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  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . 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.

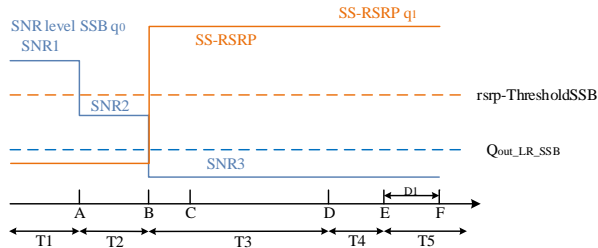
#### 4.5.5.1.3 Minimum conformance requirements

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  $q_0$  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  $q_1$  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
	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	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	
SMTTC Configuration	Config 1, 2, 4, 5	SMTTC.1	
	Config 3, 6	SMTTC.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 ( $q_0$ )		0	
SSB Index assigned as CBD RS ( $q_1$ )		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

Parameter		Unit	Value	Comment
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
rimInSyncOutOfSyncThreshold			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 $Q_{in\_LR\_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in\_LR\_SSB}$
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* (embedded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.
3. The UE sends an *RRCReconfigurationComplete* (embedded 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  $q_1$  before time point B; and
  - c) detects preamble on a beam associated with the candidate beam set  $q_1$  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.
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 {			



Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	Value/remark	Comment	Condition
s1	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		

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#### 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 <sub>SSB</sub> of set q <sub>0</sub>	Config 1, 4					
	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 <sub>SSB</sub> of set q <sub>1</sub>	Config 1, 4	-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 <sub>RP</sub> of set q <sub>1</sub>	Config 1, 4	-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
$N_{oc}$	Config 1, 4	-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 q <sub>0</sub> 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 q<sub>1</sub>.

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  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  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  $q_0$  configured for a serving PCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PCell, 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.

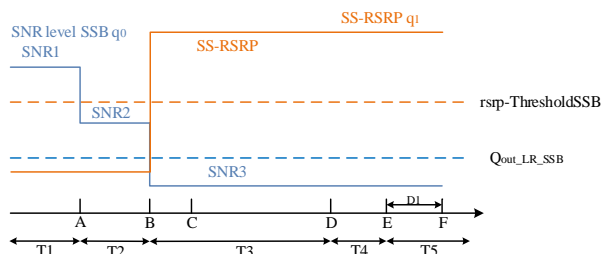
##### 4.5.5.2.3 Minimum conformance requirements

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  $q_0$  in the active PCell 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  $q_1$  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	10: NR <sub>B,c</sub> = 52	
	Config 2, 5	10: NR <sub>B,c</sub> = 52	
	Config 3, 6	40: NR <sub>B,c</sub> = 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	

Parameter		Unit	Value	Comment
			Test 1	
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 ( $q_0$ )			0	
SSB Index assigned as CBD RS ( $q_1$ )			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.	
rimInSyncOutOfSyncThreshold			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 $Q_{in\_LR\_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in\_LR\_SSB}$
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	

Parameter		Unit	Value	Comment
			Test 1	
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  $q_1$  before time point B; and
  - c) detects preamble on a beam associated with the candidate beam set  $q_1$  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 {			
s1	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	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	-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



Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
SSB_RP of set $q_1$	Config 1, 4	dBm/SC S 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
$N_{oc}$	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 $q_0$ 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  $q_1$ .

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  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  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  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . 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  $q_0$  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  $q_1$  of the candidate beam used for link recovery.

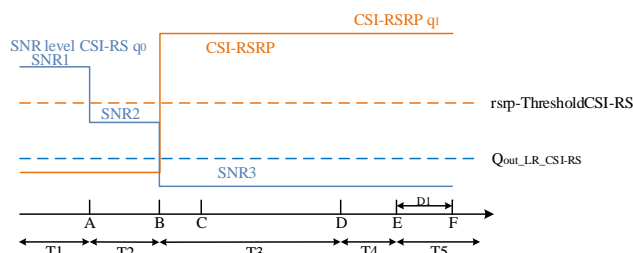


Figure 4.5.5.3.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

##### 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 DUT Part A.3.2.3.4	As specified in TS 38.508-1 [14] Annex A.
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	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 $q_0$		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	dB	0	

Parameter	Unit	Value		Comment
			Test 1	
average CSI-RS RE energy				
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 $q_1$			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 $Q_{in\_LR\_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in\_LR\_SSB}$
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 $q_0$ and $q_1$	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  $q_1$  before time point B, and
  - c) detects preamble on a beam associated with the candidate beam set  $q_1$  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.3.1-11 with Condition CSI-RS 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 {			
s1	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					
	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	-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	-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
$N_{oc}$	Config 1, 4	-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  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . 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  $q_0$  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  $q_1$  of the candidate beam used for link recovery.

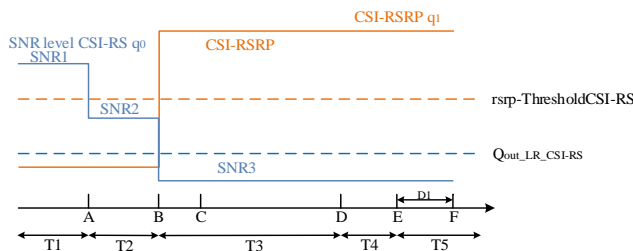


Figure 4.5.5.4.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

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	

Parameter		Unit	Value	Comment
			Test 1	
csi-RS-Index assigned as beam failure detection RS in set $q_0$			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 $q_1$			1	
rimInSyncOutOfSyncThreshold			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 $Q_{in\_LR\_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in\_LR\_SSB}$
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 $q_0$ and $q_1$	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	

Parameter	Unit	Value	Comment
		Test 1	
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**

#### 4.5.5.5 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  $q_0$  configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . 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  $q_0$  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  $q_1$  of the candidate beam used for link recovery.

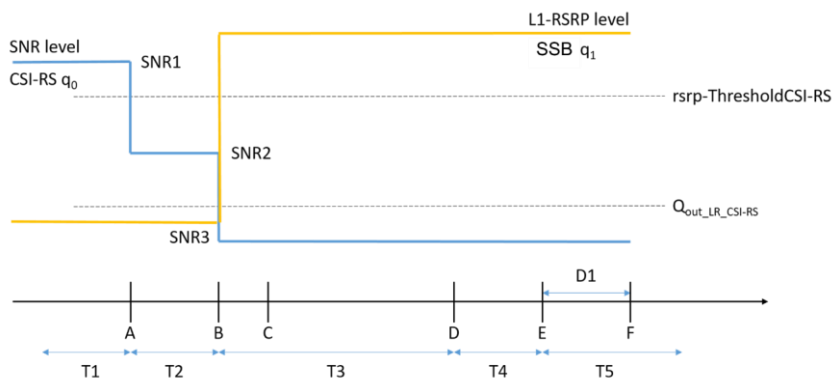


Figure 4.5.5.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

4.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.1-1.

Table 4.5.5.4.1-1: 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 4.5.5.4.1-2.

Table 4.5.5.4.1-2: 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 4.5.5.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1
	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 4.5.5.4.1-3.

2. Message contents are defined in clause 4.5.5.4.3.

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 4.5.5.4.1-3: 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 Reference Channel	Config 1, 4		CR.1.1 FDD	A. 1.2
	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	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 $q_0$ in activated SCell			0	
OCNG parameters			OP.1	A.2.1
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.	
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	
rimInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdBFRSSB	Config 1, 2, 4, 5	dBm/SCS kHz	-98	Threshold used for $Q_{in\_LR\_SSB}$
	Config 3, 6		-95	
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 $q_0$ 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	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	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 $q_0$	Config 1, 4	dB						
	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 $q_1$	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 $q_1$	Config 1, 4	dBm/SCS kHz	-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
$N_{oc}$	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				
<p>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.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>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.</p> <p>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].</p>								

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  $q_1$ .

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  $q_1$ . 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  $q_1$  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  $q_0$  configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . 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  $q_0$  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  $q_1$  of the candidate beam used for link recovery.

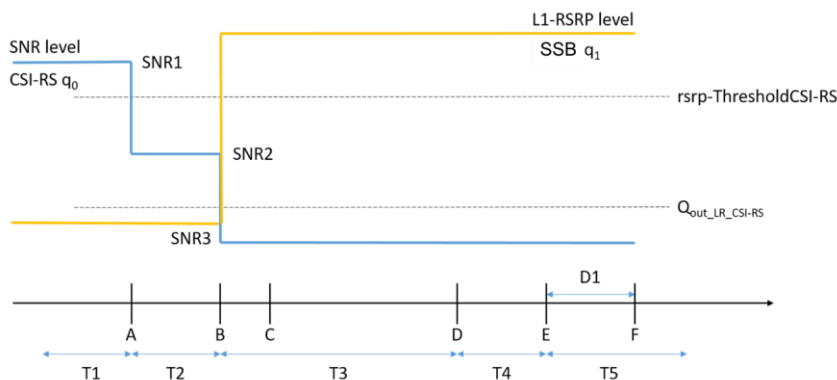


Figure 4.5.5.6.4.1-1: SNR and L1-RSRP variation for beam failure detection and LR testing for SCell in DRX mode

##### 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
	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	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	A.1.2	
	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		
SMTTC Configuration	Config 1, 2, 3, 4, 5, 6	SMTTC.1	A.4	
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5	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 $q_0$ in activated SCell		0		
OCNG parameters		OP.1	A.2.1	
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	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	
rimInSyncOutOfSyncThreshold			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 Config 3, 6	dBm/SCS	-98	Threshold used for $Q_{in\_LR\_SSB}$
			-95	
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 $q_0$ 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	0	0	0	0	0	0
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PSS to SSS								
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								
SNR_SSB of set $q_0$	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 $q_1$	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 $q_1$	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
$N_{oc}$	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				
<p>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.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>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.</p> <p>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.</p>								

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  $q_1$ .



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  $q_1$ . 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  $q_1$  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%.

## 4.5.6 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  $T_{\text{BWPswitchDelay}}$  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  $T_{\text{BWPswitchDelay}}$  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  $T_{\text{BWPswitchDelay}}$  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  $T_{\text{BWPswitchDelay}}$  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  $T_{\text{BWPswitchDelay}}$  defined in Table 4.5.6.1.0.1-1.

**Table 4.5.6.1.0.1-1: BWP switch delay**

$\mu$	NR Slot length (ms)	BWP switch delay $T_{\text{BWPswitchDelay}}$ (slots)	
		Type 1 <sup>Note 1</sup>	Type 2 <sup>Note 1</sup>
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:

- $T_{\text{BWPswitchDelay}}$ , 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
- $T_{\text{BWPswitchDelay}} + 1$ , 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  $T_{\text{BWPswitchDelay}}$  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  $T_{\text{BWPswitchDelay}}$  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**

$\mu$	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
<i>locationAndBandwidth</i>	From TS 38.331 [13]
<i>nrofSRS-Ports</i>	
<i>maxMIMO-Layers-r16</i>	

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  $T_{\text{BWPswitchDelay}}$  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 ( $T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}$ ) 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 DUT Part	A.3.1.8.2 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.

**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
<i>bwp-InactivityTimer</i>	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.

Before the test starts,

- 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.

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, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.1.1.4.3-2.
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 ( $i + T_{\text{BWPswitchDelay}} + k_1$ ); 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 ( $i + T_{\text{BWPswitchDelay}} + 1$  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 ( $j + T_{\text{BWPswitchDelay}} + k_1$ ); 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 ( $j + T_{\text{BWPswitchDelay}} + 1$  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 {			
pdccch-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
}			
}			

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*

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 {			
PDSCH-TimeDomainResourceAllocation[1]		entry 1	
SEQUENCE {			
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[2]			
SEQUENCE {			
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
}			
PDSCH-TimeDomainResourceAllocation[3]			
SEQUENCE {			
k0	T <sub>BWPswitchDelay</sub>	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	
}			



Derivation Path: TS 38.508-1 [14], Table 4.6.3-103

Information Element	Value/remark	Comment	Condition
}			
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	
}			
}			

#### 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 Config 2,3,5,6	FDD TDD
TDD configuration	Config 1,4 Config 2,5 Config 3,6	Not Applicable TDDConf.1.1 TDDConf.2.1
BW <sub>channel</sub>	Config 1,4 Config 2,5 Config 3,6	10 MHz: N <sub>RB,c</sub> = 52 10 MHz: N <sub>RB,c</sub> = 52 40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID		1, 2
Initial DL BWP Configuration	Config 1,4 Config 2,5 Config 3,6	DLBWP.0.2 <sup>Note 4</sup>
Active DL BWP-1 Configuration	Config 1,4 Config 2,5 Config 3,6	DLBWP.1.1 <sup>Note 4</sup>
Active DL BWP-2 Configuration	Config 1,4 Config 2,5 Config 3,6	DLBWP.1.3 <sup>Note 4</sup>
Initial UL BWP Configuration	Config 1,4 Config 2,5 Config 3,6	ULBWP.0.2 <sup>Note 4</sup>
Active UL BWP-1 Configuration	Config 1,4 Config 2,5 Config 3,6	ULBWP.1.1 <sup>Note 4</sup>
Active UL BWP-2 Configuration	Config 1,4 Config 2,5 Config 3,6	N/A ULBWP.1.3 <sup>Note 4</sup> ULBWP.1.3 <sup>Note 4</sup>
PDSCH Reference measurement channel	Config 1,4 Config 2,5 Config 3,6	SR.1.1 FDD SR.1.1 TDD SR.2.1 TDD
RMSI CORESET parameters	Config 1,4 Config 2,5 Config 3,6	CR.1.1 FDD CR.1.1 TDD CR.2.1 TDD
Dedicated CORESET parameters	Config 1,4 Config 2,5 Config 3,6	CCR.1.2 FDD CCR.1.2 TDD CCR.2.4 TDD
OCNG Patterns		OP.1
SSB Configuration	Config 1,2,4,5 Config 3,6	SSB.1 FR1 SSB.2 FR1
SMTc Configuration		SMTc.1

Parameter		Unit	Cell 2
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)			
$N_{oc}$ <sup>Note 2</sup>	Config 1,2,4,5	dBm/SCS	-104
	Config 3,6		-101
$N_{oc}$ <sup>Note 2</sup>	dBm/15kHz		-104
	SS-RSRP <sup>Note 3</sup>	Config 1,2,4,5	dBm/SCS
Config 3,6			-84
$\bar{E}_s/I_{ot}$		dB	17
$\bar{E}_s/N_{oc}$		dB	17
$I_o$ <sup>Note 3</sup>	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 $N_{oc}$ to be fulfilled.			
NOTE 3: SS-RSRP and $I_o$ 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 ( $i+T_{BWPswitchDelay}+k_1$ ).

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 ( $j+T_{BWPswitchDelay}+k_1$ ).

Where,  $k_1$  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  $T_{BWPswitchDelay}$  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 ( $i + T_{\text{BWPswitchDelay}+k_1}$ ), ( $j + T_{\text{BWPswitchDelay}+k_1}$ ), 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 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, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.6.1.2-2	LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.6.1.2-3	LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode
4.5.6.1.2-4	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode
4.5.6.1.2-5	LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode
4.5.6.1.2-6	LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ 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 $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) 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**

Config <sub>SCell</sub>	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 ( $BW_{\text{channel}}$ ) 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
	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.

**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	
<i>bwp-InactivityTimer</i>	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.

Before the test starts:

- 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.

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, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.1.2.4.3-2.
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 ( $i + T_{\text{BWPswitchDelay}} + k_1$ ); 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 ( $i + T_{\text{BWPswitchDelay}} + 1 \text{ subframe} + k$ ); 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 ( $i + T_{\text{BWPswitchDelay}} + \text{ Interruption length} + k_1$ ); 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:
- 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 ( $j + T_{\text{BWPswitchDelay}} + 1$  subframe +  $k$ ); and
  - 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 ( $j + T_{\text{BWPswitchDelay}} + k_1$ ); and
  - If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ( $i + T_{\text{BWPswitchDelay}} + \text{Interruption length} + k_1$ ); and
  - If the number of consecutive missing ACK/NACK for PCell is no more than 2 for configuration 4.5.6.1.2-1/2/3 and no more than 1 for configuration 4.5.6.1.2-4/5/6; and
  - If the number of consecutive missing ACK/NACK for PSCell is no more than 2 for configuration 4.5.6.1.2-1/4 and no more than 1 for configuration 4.5.6.1.2-2/3/5/6. 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 8.2.2.2.5-1-1.

$k$  is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

$k_1$  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 {			
pdccch-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
}			
}			

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

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]		entry 1	
SEQUENCE {			
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[2]		entry 2	
SEQUENCE {			
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
}			
PDSCH-TimeDomainResourceAllocation[3]		entry 3	
SEQUENCE {			
k0	T <sub>BWPswitchDelay</sub>	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]		entry 4	
SEQUENCE {			
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

## 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



BW <sub>channel</sub>			Note 7
BW <sub>occupied</sub>	Config 1,2,4,5	RB	52 <sup>Note 5</sup>
	Config 3,6		106 <sup>Note 6</sup>
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 <sup>Note 5</sup>
	Config 3,6		OP.1 <sup>Note 6</sup>
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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
N <sub>oc</sub> <sup>Note 2</sup>			
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
E <sub>s</sub> /I <sub>ot</sub>		dB	17
E <sub>s</sub> /N <sub>oc</sub>		dB	17
I <sub>o</sub> <sup>Note 3</sup>	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 N <sub>oc</sub> to be fulfilled within BW <sub>occupied</sub> .			
Note 3: SS-RSRP and I <sub>o</sub> 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 BW <sub>occupied</sub> (i.e. 10 MHz, 52 RBs) from F <sub>C,low</sub> , and I <sub>o</sub> is independent of the BW <sub>channel</sub> configured.			
Note 6: All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106 RBs) from F <sub>C,low</sub> , and I <sub>o</sub> is independent of the BW <sub>channel</sub> configured.			
Note 7: N <sub>RB,c</sub> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .			

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	Config <sub>SCell 1</sub>		FDD
	Config <sub>SCell 2,3</sub>		TDD
TDD configuration	Config <sub>SCell 1</sub>		Not Applicable
	Config <sub>SCell 2</sub>		TDDConf.1.1
	Config <sub>SCell 3</sub>		TDDConf.2.1
BW <sub>channel</sub>			Note 7
BW <sub>occupied</sub>	Config <sub>SCell 1,2</sub>	RB	52 <sup>Note 5</sup>
	Config <sub>SCell 3</sub>		106 <sup>Note 6</sup>
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	Config <sub>SCell 1</sub>		SR.1.1 FDD
	Config <sub>SCell 2</sub>		SR.1.1 TDD
	Config <sub>SCell 3</sub>		SR.2.1 TDD
RMSI CORESET parameters	Config <sub>SCell 1</sub>		CR.1.1 FDD
	Config <sub>SCell 2</sub>		CR.1.1 TDD
	Config <sub>SCell 3</sub>		CR.2.1 TDD
Dedicated CORESET parameters	Config <sub>SCell 1</sub>		CCR.1.2 FDD
	Config <sub>SCell 2</sub>		CCR.1.2 TDD
	Config <sub>SCell 3</sub>		CCR.2.4 TDD
OCNG Patterns	Config <sub>SCell 1,2</sub>		OP.1 <sup>Note 5</sup>
	Config <sub>SCell 3</sub>		OP.1 <sup>Note 6</sup>
SSB Configuration	Config <sub>SCell 1,2</sub>		SSB.1 FR1
	Config <sub>SCell 3</sub>		SSB.2 FR1
SMTC Configuration			SMTC.1
TRS Configuration	Config <sub>SCell 1</sub>		TRS.1.1 FDD
	Config <sub>SCell 2</sub>		TRS.1.1 TDD
	Config <sub>SCell 3</sub>		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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
N <sub>oc</sub> <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87
E <sub>s</sub> /I <sub>ot</sub>		dB	17
E <sub>s</sub> /N <sub>oc</sub>		dB	17
I <sub>0</sub> <sup>Note 3</sup>	Config <sub>SCell 1,2</sub>	dBm/9.36MHz	-58.96
	Config <sub>SCell 3</sub>	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 $N_{oc}$ to be fulfilled within $BW_{occupied}$ .
Note 3:	SS-RSRP and $I_0$ 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.
Note 6:	All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.
Note 7:	$N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .

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 ( $i+T_{BWPswitchDelay}+k_1$ ).

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 ( $j+T_{BWPswitchDelay}+k_1$ ).

Where,  $k_1$  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  $T_{BWPswitchDelay}$  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 ( $i+T_{BWPswitchDelay}+k_1$ ), ( $j+T_{BWPswitchDelay}+k_1$ ), 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  $\frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$  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.

$T_{RRCprocessingDelay}$  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

$T_{BWPswitchDelayRRC} = 6ms$  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  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  on the cell where RRC-based BWP switch occurs. When  $T_{HARQ} > T_{RRCprocessingDelay}$  a longer switching delay is allowed. Where  $T_{HARQ}$  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.

**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.

Before the test starts:

- 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.

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  $i+X+k$  then 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 {			
pdccch-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 { BWP-Uplink[1]	1 entry		
	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
BW <sub>channel</sub>	Config 1,4	10 MHz: N <sub>RB,c</sub> = 52
	Config 2,5	10 MHz: N <sub>RB,c</sub> = 52
	Config 3,6	40 MHz: N <sub>RB,c</sub> = 106
Active DL BWP ID		1
Initial DL BWP Configuration	Config 1,4	DLBWP.0.2 <sup>Note4</sup>
	Config 2,5	



Parameter		Unit	Cell 2	
Initial UL BWP Configuration		Config 3,6	ULBWP.0.2 <sup>Note4</sup>	
		Config 1,4		
		Config 2,5		
		Config 3,6		
Initial Condition	Active DL BWP-1 Configuration	Config 1,4	DLBWP.1.3 <sup>Note4</sup>	
		Config 2,5		
	Active UL BWP-1 Configuration	Config 1,4		ULBWP.1.3 <sup>Note4</sup>
		Config 2,5		
	Config 3,6			
	Config 3,6			
Final Condition	Active DL BWP-1 Configuration	Config 1,4	DLBWP.1.1 <sup>Note4</sup>	
		Config 2,5		
	Active UL BWP-1 Configuration	Config 1,4		ULBWP.1.1 <sup>Note4</sup>
		Config 2,5		
	Config 3,6			
	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	
SMTTC Configuration			SMTTC.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)				
$N_{oc}$ <sup>Note 2</sup>				dBm/15 kHz
SS-RSRP <sup>Note 3</sup>		dBm/15 kHz	-87	
$\bar{E}_s/I_{ot}$		dB	17	
$\bar{E}_s/N_{oc}$		dB	17	
$I_o$ <sup>Note3</sup>	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 $N_{oc}$ to be fulfilled.				
NOTE 3: SS-RSRP and $I_o$ 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  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ , and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k_1$

Where,

$T_{\text{RRCprocessingDelay}} = 20$  ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

$T_{\text{BWPswitchDelayRRC}} = 6$  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.

$k_1$  is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives  $\frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} =$

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 SCCells.

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  $n + T_{\text{config PSCell}}$ .

Where:

$$T_{\text{config\_PSCell}} = T_{\text{RRC\_delay}} + T_{\text{processing}} + T_{\text{search}} + T_{\Delta} + T_{\text{PSCell\_DU}} + 2 \text{ ms}$$

$T_{\text{RRC\_delay}}$  is the RRC procedure delay as specified in TS 36.331 [29].

$T_{\text{processing}}$  is the SW processing time needed by UE, including RF warm up period.  $T_{\text{processing}} = 20$  ms if NR PSCell is in FR1,  $T_{\text{processing}} = 40$  ms if NR PSCell is in FR2.

$T_{\text{search}}$  is the time for AGC settling and PSS/SSS detection.

- For NR PSCell in FR1: if the target cell is a known cell,  $T_{\text{search}} = 0$  ms. If the target cell is an unknown cell and the target cell  $E_s/I_{\text{ot}} \geq -2$  dB, then  $T_{\text{search}} = 3 * \text{Tr}_s$  ms;
- For NR PSCell in FR2: if the target cell is a known cell,  $T_{\text{search}} = 0$  ms. If the target cell is an unknown cell and the target cell  $E_s/I_{\text{ot}} \geq -2$  dB, then  $T_{\text{search}} = 24 * \text{Tr}_s$  ms.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = 1 * \text{Tr}_s$  ms for a known or unknown PSCell.

$T_{\text{PSCell\_DU}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the NR PSCell.  $T_{\text{PSCell\_DU}}$  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].

$\text{Tr}_s$  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  $\text{Tr}_s$  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  $T_{rs} = 5$  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  $n + T_{RRC\_delay}$ :

Where

$T_{RRC\_delay}$  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
	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.	

Parameter	Unit	Value	Comment
T2	s	1.5	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.

#### 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.
8. The UE shall transmit an *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). T3 starts when the UE receives the RRC message.
10. The UE shall transmit an *RRCConnectionReconfigurationComplete message*.
11. The UE shall send a PRACH to PSCell during T3. The UE shall send PRACH no later than 82ms 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 *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). T5 starts when the UE receives 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 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 =  $[(\text{current cell 2 physical cell identity} + 1) \bmod 1008]$  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: CSI-ReportConfig**

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12F				
Information Element	Value/remark	Comment	Condition	
CSI-ReportConfig ::= SEQUENCE {				
csi-IM-ResourcesForInterference	Not present			
nzp-CSI-RS-ResourcesForInterference	Not present			
reportConfigType CHOICE {				
periodic SEQUENCE {				
reportSlotConfig CHOICE {				
slots5	2		SCS15	
slots10	4		SCS30	
}				
pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF PUCCH-CSI-Resource {	1 entry			
PUCCH-CSI-Resource [1] SEQUENCE {				
uplinkBandwidthPartId	BWP-Id of active BWP			
pucch-Resource	8	PUCCH-format2 as configured in TS 38.508-1 [14], Table 4.6.3-112		
}				
}				
}				

## 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
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				

Parameter	Unit	Config	Test				
			T1	T2	T3	T4	T5
BW <sub>channel</sub>	MHz	3,6	TDDConf.2.1				
		1,4	10: N <sub>RB,c</sub> = 52				
		2,5	10: N <sub>RB,c</sub> = 52				
		3,6	40: N <sub>RB,c</sub> = 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)							

Parameter	Unit	Config	Test					
			T1	T2	T3	T4	T5	
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
$N_{oc}$ <sup>Note2</sup>	dBm/15 kHz	1,2,4,5	N/A				-88.6	
		3,6	N/A				-88.6	
$N_{oc}$ <sup>Note2</sup>	dBm/SCS	1,2,4,5	N/A				-88.6	
		3,6	N/A				-85.6	
$\hat{E}_s/I_{ot}$		1,2,3,4,5,6	-infinity				0	
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	-infinity				0	
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2,4,5	-infinity				-88.6	
		3,6	-infinity				-85.6	
$I_o$ <sup>Note3</sup>	dBm/9.36MHz	1,2,4,5	N/A				-57.6	
		3,6	N/A				-51.5	
Propagation condition		1,2,3,4,5,6	AWGN					
<p>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.</p> <p>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 <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p>								

The UE shall transmit the PRACH to PSCell no later than 82 ms<sup>Note1</sup> from the start of 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 no later than 20ms from the start of T5.

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:

$$T_{\text{config\_PSCell}} = T_{\text{RRC\_delay}} + T_{\text{processing}} + T_{\text{search}} + T_{\Delta} + T_{\text{PSCell\_DU}} + 2\text{ms}$$

Where:

$$T_{\text{RRC\_delay}} = 20\text{ms}$$

$$T_{\text{processing}} = 20\text{ms}$$

$$T_{\text{search}} = 0$$

$$T_{\Delta} = 20\text{ms}$$

$$T_{\text{PSCell\_DU}} = 1 \cdot 10 + 10 = 20\text{ms}$$



## 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**

$\mu$	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 <i>uplinkTxSwitchingPeriod</i> .			

### 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
	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 <i>uplinkTxSwitchingOptionSupport-r16</i>
	dualUL		UE reports 'dualUL' for capability IE <i>uplinkTxSwitchingOptionSupport-r16</i>
}			

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
BW <sub>channel</sub>	Config 1		40 MHz; N <sub>RB,c</sub> = 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			SRSCConf.4 in Table 4.5.8.1.5-2
PDSCH Reference measurement channel	Config 1		SR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTTC Configuration			SMTTC.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)			
N <sub>oc</sub> <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP <sup>Note 3</sup>		dBm/SCS	84
E <sub>s</sub> /I <sub>ot</sub>		dB	17
E <sub>s</sub> /N <sub>oc</sub>		dB	17
N <sub>oc</sub> <sup>Note 2</sup>	Config 1	dBm/SCS	-101
I <sub>o</sub> <sup>Note3</sup>	Config 1	dBm/38.16MHz	-52.86
Time offset to Cell1 <sup>Note 5</sup>		μs	0
Propagation Condition			AWGN
<p>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.</p> <p>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 N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>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.</p>			

Table 4.5.8.1.5-2: SRS Configuration for DL Interruptions at switching between two uplink carriers

	Field	SRSCnf.4	Comments
SRS-ResourceSet	srs-ResourceSetId	0	
	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 N <sub>RB,c</sub>
	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  $T_{\text{identify\_intra\_without\_index}}$  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  $T_{\text{identify\_intra\_with\_index}}$ . The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within  $T_{\text{identify\_intra\_without\_index}}$ . It is assumed that *deriveSSB-IndexFromCellis* always enabled for FR1 TDD and FR2.

$$T_{\text{identify\_intra\_without\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}}) \text{ ms}$$

$$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} + T_{\text{SSB\_time\_index\_intra}}) \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra}}$ : 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)

$T_{\text{SSB\_time\_index\_intra}}$ : 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)

$T_{\text{SSB\_measurement\_period\_intra}}$ : 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 ()

$\text{CSSF}_{\text{intra}}$ : it is a carrier specific scaling factor and is determined

- according to  $\text{CSSF}_{\text{outside\_gap},i}$  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  $\text{CSSF}_{\text{within\_gap},i}$  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*.

$M_{\text{pss/sss\_sync\_w/o\_gaps}}$ : For a UE supporting FR2 power class 1,  $M_{\text{pss/sss\_sync}}=40$ . For a UE supporting power class 2,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=24$ . For a UE supporting FR2 power class 3,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=24$ . For a UE supporting FR2 power class 4,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=24$

$M_{\text{meas\_period\_w/o\_gaps}}$ : For a UE supporting power class 1,  $M_{\text{meas\_period\_w/o\_gaps}}=40$ . For a UE supporting FR2 power class 2,  $M_{\text{meas\_period\_w/o\_gaps}}=24$ . For a UE supporting power class 3,  $M_{\text{meas\_period\_w/o\_gaps}}=24$ . For a UE supporting power class 4,  $M_{\text{meas\_period\_w/o\_gaps}}=24$ .

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs,  $K_p=1$

When intra-frequency SMTC is partially overlapping with measurement gaps,  $K_p = 1/(1 - (\text{SMTC period} / \text{MGRP}))$ , 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  $T_{\text{identify\_intra\_without\_index}}$  or  $T_{\text{identify\_intra\_with\_index}}$

For FR2,

$K_{\text{layer1\_measurement}}=1$ ,

- 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*;

$K_{\text{layer1\_measurement}}=1.5$ , 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	$T_{\text{PSS/SSS\_sync\_intra}}$
No DRX	$\max(600\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq 320\text{ms}$	$\max(600\text{ms}, \text{ceil}(M2^{\text{Note 2}} \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $> 320\text{ms}$	$\text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$

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.

**Table 4.6.1.0.1-2: Time period for PSS/SSS detection, (Frequency range FR2)**

DRX cycle	$T_{\text{PSS/SSS\_sync\_intra}}$
No DRX	$\max(600\text{ms}, \text{ceil}(M_{\text{pss/sss\_sync\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \text{SMTC period})^{\text{note 1}} \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq 320\text{ms}$	$\max(600\text{ms}, \text{ceil}(1.5 \times M_{\text{pss/sss\_sync\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $> 320\text{ms}$	$\text{ceil}(M_{\text{pss/sss\_sync\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$

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	$T_{\text{SSB\_time\_index\_intra}}$
No DRX	$\max(120\text{ms}, \text{ceil}(3 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq 320\text{ms}$	$\max(120\text{ms}, \text{ceil}(M2^{\text{Note 2}} \times 3 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $> 320\text{ms}$	$\text{Ceil}(3 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$

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.

**Table 4.6.1.0.1-4: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR1)**

DRX cycle	$T_{\text{PSS/SSS\_sync\_intra}}$
No DRX	$5 \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$

DRX cycle ≤ 320ms	$5 \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$5 \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$

**Table 4.6.1.0.1-5: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR2)**

DRX cycle	$T_{\text{PSS/SSS\_sync\_intra}}$
No DRX	$M_{\text{pss/sss\_sync\_w/o\_gaps}} \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$
DRX cycle ≤ 320ms	$M_{\text{pss/sss\_sync\_w/o\_gaps}} \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$M_{\text{pss/sss\_sync\_w/o\_gaps}} \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$

**Table 4.6.1.0.1-6: Time period for time index detection, deactivated SCell (Frequency range FR1)**

DRX cycle	$T_{\text{SSB\_time\_index\_intra}}$
No DRX	$3 \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$
DRX cycle ≤ 320ms	$3 \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$3 \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$

The measurement period for intra-frequency measurements without gaps is as shown in table 4.6.1.0.1-7, 4.6.1.0.1-8, 4.6.1.0.1-9 (deactivated SCell) or 4.6.1.0.1-10 (deactivated SCell). When *highSpeedMeasFlag-r16* is configured,  $T_{\text{SSB\_measurement\_period\_intra}}$  is specified in Table 4.6.1.0.1-11.

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  $T_{\text{SSB\_measurement\_period\_intra}}$ .

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 4.6.1.0.1-7, Table 4.6.1.0.1-8, Table 4.6.1.0.1-9 and Table 4.6.1.0.1-10 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 4.6.1.0.1-7: Measurement period for intrafrequency measurements without gaps (Frequency FR1)**

DRX cycle	$T_{\text{SSB\_measurement\_period\_intra}}$
No DRX	$\max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$
DRX cycle ≤ 320ms	$\max(200\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$\text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$

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 4.6.1.0.1-8: Measurement period for intrafrequency measurements without gaps (Frequency FR2)**

DRX cycle	$T_{\text{SSB\_measurement\_period\_intra}}$
No DRX	$\max(400\text{ms}, \text{ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$
DRX cycle ≤ 320ms	$\max(400\text{ms}, \text{ceil}(1.5 \times M_{\text{meas\_period\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$

DRX cycle > 320ms	$\text{ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$
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 4.6.1.0.1-9: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR1)**

DRX cycle	$T_{\text{SSB\_measurement\_period\_intra}}$
No DRX	$5 \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq$ 320ms	$5 \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$5 \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$

**Table 4.6.1.0.1-10: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR2)**

DRX cycle	$T_{\text{SSB\_measurement\_period\_intra}}$
No DRX	$M_{\text{meas\_period\_with\_gaps}} \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq$ 320ms	$M_{\text{meas\_period\_with\_gaps}} \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$M_{\text{meas\_period\_with\_gaps}} \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$

**Table 4.6.1.0.1-11:  $T_{\text{SSB\_measurement\_period\_intra}}$  When *highSpeedMeasFlag-r16* is configured (Frequency range FR1)**

DRX cycle	$T_{\text{SSB\_measurement\_period\_intra}}$
No DRX <sup>Note 2</sup>	$\max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq$ 160ms	$\max(200\text{ms}, \text{ceil}(5 \times M2^{\text{Note 2}} \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
160ms < DRX cycle $\leq$ 320ms	$\text{ceil}(4 \times M2^{\text{Note 2}} \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$
DRX cycle > 320ms	$\text{ceil}(Y^{\text{Note 3}} \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$
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 $\leq$ 40ms, $Y = 5$ when SMTC > 40ms.	
NOTE 4: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or [ <i>intraRAT-MeasurementEnhancement-r16</i> ] on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.	

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<sub>RP</sub> and SSB<sub>Es/Iot</sub> 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  $T_{\text{identify\_intra\_without\_index}}$  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  $T_{\text{identify\_intra\_with\_index}}$ . The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within  $T_{\text{identify\_intra\_without\_index}}$ . It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{\text{identify\_intra\_without\_index}} = T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} \text{ ms}$$

$$T_{\text{identify\_intra\_with\_index}} = T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} + T_{\text{SSB\_time\_index\_intra}}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra}}$ : it is the time period used in PSS/SSS detection given in table 4.6.1.0.2 or 4.6.1.0.2.

$T_{\text{SSB\_time\_index\_intra}}$ : it is the time period used to acquire the index of the SSB being measured given in table 4.6.1.0.2.

$T_{\text{SSB\_measurement\_period\_intra}}$ : equal to a measurement period of SSB based measurement given in table 4.6.1.0.2 or 4.6.1.0.2.

$\text{CSSF}_{\text{intra}}$ : it is a carrier specific scaling factor and is determined according to  $\text{CSSF}_{\text{within\_gap},i}$  in TS 38.133 [6] section 9.1.5.2 for measurement conducted within measurement gaps.

$M_{\text{pss/sss\_sync\_with\_gaps}}$ : For a UE supporting FR2 power class 1,  $M_{\text{pss/sss\_sync\_with\_gaps}}=40$ . For a UE supporting FR2 power class 2,  $M_{\text{pss/sss\_sync\_with\_gaps}}=24$ . For a UE supporting FR2 power class 3,  $M_{\text{pss/sss\_sync\_with\_gaps}}=24$ . For a UE supporting power class 4,  $M_{\text{pss/sss\_sync\_with\_gaps}}=24$

$M_{\text{meas\_period\_with\_gaps}}$ : For a UE supporting power class 1,  $M_{\text{meas\_period\_with\_gaps}}=40$ . For a UE supporting power class 2,  $M_{\text{meas\_period\_with\_gaps}}=24$ . For a UE supporting power class 3,  $M_{\text{meas\_period\_with\_gaps}}=24$ . For a UE supporting power class 4,  $M_{\text{meas\_period\_with\_gaps}}=24$ .

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  $T_{\text{identify\_intra\_without\_index}}$  or  $T_{\text{identify\_intra\_with\_index}}$ .

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	$T_{\text{pss/sss\_sync\_intra}}$
No DRX	$\max(600\text{ms}, 5 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq$ 320ms	$\max(600\text{ms}, \text{ceil}(1.5 \times 5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $>$ 320ms	$5 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$

**Table 4.6.1.0.2-2: Time period for PSS/SSS detection (Frequency range FR2)**

DRX cycle	$T_{\text{pss/sss\_sync\_intra}}$
No DRX	$\max(600\text{ms}, M_{\text{pss/sss\_sync\_with\_gaps}} \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $\leq$ 320ms	$\max(600\text{ms}, \text{ceil}(1.5 \times M_{\text{pss/sss\_sync\_with\_gaps}}) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$
DRX cycle $>$ 320ms	$M_{\text{pss/sss\_sync\_with\_gaps}} \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$



**Table 4.6.1.0.2: Time period for time index detection (Frequency range FR1)**

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	$\max(120\text{ms}, 3 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{intra}$
DRX cycle $\leq 320\text{ms}$	$\max(120\text{ms}, \text{ceil}(1.5 \times 3) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$
DRX cycle $> 320\text{ms}$	$3 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{intra}$

[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	$\max(200\text{ms}, 5 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{intra}$
DRX cycle $\leq 320\text{ms}$	$\max(200\text{ms}, \text{ceil}(1.5 \times 5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$
DRX cycle $> 320\text{ms}$	$5 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{intra}$

**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	$\max(400\text{ms}, M_{meas\_period\ with\_gaps} \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{intra}$
DRX cycle $\leq 320\text{ms}$	$\max(400\text{ms}, \text{ceil}(1.5 \times M_{meas\_period\ with\_gaps}) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle}))^{Note\ 1} \times \text{CSSF}_{intra}$
DRX cycle $> 320\text{ms}$	$M_{meas\_period\ with\_gaps} \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{intra}$

[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:  $2 \times TTI_{DCCH}$ . 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  $T_{identify\ intra\ without\ index}$  or  $T_{identify\ intra\ with\ index}$  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  $T_{\text{Measurement\_Period, Intra}}$  provided the timing to that cell has not changed more than  $\pm 3200 T_c$  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 $\mu$ s	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 $\mu$ s	Synchronous cells
		3	3 $\mu$ s	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 =  $[(\text{current cell 3 physical cell identity} + 1) \bmod 14 + 2]$  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 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.1-2 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	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
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	
$N_{oc}^{note 2}$	dBm/SCS	1	-98			
		2	-98			
		3	-95			
$N_{oc}^{note 2}$	dBm/15 kHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP <sup>note 3</sup>	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 $N_{oc}$ 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:

$$T_{\text{identify\_intra\_without\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}}) \text{ ms}$$

$$T_{\text{PSS/SSS\_sync\_intra}} = \max[600\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period}] \times \text{CSSF}_{\text{intra}} = 600\text{ms}$$

$$T_{\text{SSB\_measurement\_period\_intra}} = \max[200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period}] \times \text{CSSF}_{\text{intra}} = 200 \text{ ms}$$

Which:

$$K_p = 1;$$

SMTC period as defined in Table 4.6.1.1.4.1-3;

$$\text{CSSF}_{\text{intra}} = 1$$

$$\text{TTI insertion uncertainty} = \text{TTI}_{\text{DCCH}} = 1 \text{ ms}; 2 \times \text{TTI}_{\text{DCCH}} = 2 \text{ ms}$$

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  $2 \times TTI_{DCCH}$  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		

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 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 $\mu$ s		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 $\mu$ s		Synchronous cells
		3	3 $\mu$ s		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 FR1 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

## 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		DLBWP.0.1	
			ULBWP.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	
$N_{oc}$ <sup>note 2</sup>	dBm/SCS	1			-98	
		2			-98	
		3			-95	
$N_{oc}$ <sup>note 2</sup>	dBm/15 KHz	1			-98	
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP <sup>note 3</sup>	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
$I_o$	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 $N_{oc}$ 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:

$$T_{\text{identify\_intra\_without\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}}) \text{ ms}$$

$$T_{\text{PSS/SSS\_sync\_intra}} = \max[600\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})] \times \text{CSSF}_{\text{intra}} = 600\text{ms}$$

$$T_{\text{SSB\_measurement\_period\_intra}} = \max[200\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})] \times \text{CSSF}_{\text{intra}} = 320 \text{ ms}$$

Which:

$$K_p = 1;$$

SMTC period as defined in Table 4.6.1.2.4.1-3;

$$\text{DRX cycle} = 40;$$

$$\text{CSSF}_{\text{intra}} = 1$$

$$\text{TTI insertion uncertainty} = \text{TTI}_{\text{DCCH}} = 1 \text{ ms}; 2 \times \text{TTI}_{\text{DCCH}} = 2 \text{ ms}$$

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:

$$T_{\text{identify\_intra\_without\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}}) \text{ ms}$$

$$T_{\text{PSS/SSS\_sync\_intra}} = \text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}} = 3200\text{ms}$$

$$T_{\text{SSB\_measurement\_period\_intra}} = \text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}} = 3200 \text{ ms}$$

Which:

$$K_p = 1;$$

$$\text{DRX cycle} = 640;$$

$$\text{CSSF}_{\text{intra}} = 1$$

$$\text{TTI insertion uncertainty} = \text{TTI}_{\text{DCCH}} = 1 \text{ ms}; 2 \times \text{TTI}_{\text{DCCH}} = 2 \text{ ms}$$

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  $2 \times \text{TTI}_{\text{DCCH}}$  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 DUT Part	A.3.1.8.2 A.3.2.3.4 As specified in TS 38.508-1 [14] Annex A.
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 $\mu$ s	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 $\mu$ s	Synchronous cells
		3,6	3 $\mu$ s	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 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.3-2 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[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[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		

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
RLM-RS		1-6	CSI-RS		SSB	
$N_{oc}$ Note 2	dBm/SCS	1,4	-98			
		2,5	-98			
		3,6	-95			
$N_{oc}$ Note 2	dBm/15 kHz	1,4	-98			
		2,5				
		3,6				
$\hat{E}_s/I_{ot}$	dB	1,4	4	-1.46	-Infinity	-1.46
		2,5				
		3,6				
$\hat{E}_s/N_{oc}$	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
		2,5	-64.60	-62.25	-64.60	-62.25
		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 $N_{oc}$ 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  $2 \times TTI_{DCCH}$  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 =  $T_{\text{identify\_intra\_with\_index}}$

where,

$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}})$  ms

$T_{\text{PSS/SSS\_sync\_ntra}} = \max(600\text{ms, ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(600\text{ms, ceil}(5 \times 1) \times 20\text{ms}) \times 1 = 600\text{ms}$

$T_{\text{SSB\_measurement\_period\_intra}} = \max(200\text{ms, ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(200\text{ms, ceil}(5 \times 1) \times 20\text{ms}) \times 1 = 200\text{ms}$

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
	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 $\mu$ s		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 $\mu$ s		Synchronous cells
		3,6	3 $\mu$ s		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 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.3-2 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] } firstActiveDownlinkBWP-Id	1	DLBWP.1.2 configuration	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE { uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { BWP-Uplink[1] } firstActiveUplinkBWP-Id	1	ULBWP.1.2 configuration	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	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
RLM-RS		1-6	CSI-RS		SSB	
$N_{oc}$ Note 2	dBm/SCS	1,4	-98			
		2,5	-98			
		3,6	-95			
$N_{oc}$ Note 2	dBm/15 KHz	1,4	-98			
		2,5				
		3,6				
$\hat{E}_s/I_{ot}$	dB	1,4	4	-1.46	-Infinity	-1.46
		2,5				
		3,6				
$\hat{E}_s/N_{oc}$	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 $N_{oc}$ 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  $2 \times TTI_{DCCH}$  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 =  $T_{\text{identify\_intra\_with\_index}}$

where,

For Test 1:

$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_ntra}} + T_{\text{SSB\_measurement\_period\_intra}})$  ms

$T_{\text{PSS/SSS\_sync\_ntra}} = \max(600\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period, DRX cycle})) \times \text{CSSF}_{\text{intra}} = \max(600\text{ms}, \text{ceil}(1.5 \times 5 \times 1) \times \max(20\text{ms}, 40\text{ms})) \times 1 = 600\text{ms}$

$T_{\text{SSB\_measurement\_period\_intra}} = \max(200\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period, DRX cycle})) \times \text{CSSF}_{\text{intra}} = \max(200\text{ms}, \text{ceil}(1.5 \times 5 \times 1) \times \max(20\text{ms}, 40\text{ms})) \times 1 = 320\text{ms}$

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:

$$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_ntra}} + T_{\text{SSB\_measurement\_period\_intra}}) \text{ ms}$$

$$T_{\text{PSS/SSS\_sync\_ntra}} = \text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}} = \text{ceil}(5 \times 1) \times 640\text{ms} \times 1 = 3200\text{ms}$$

$$T_{\text{SSB\_measurement\_period\_intra}} = \text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}} = \text{ceil}(5 \times 1) \times 640\text{ms} \times 1 = 3200\text{ms}$$

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		
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 $\mu$ s	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.2 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.3.4-1 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	
$N_{oc}$ Note 2	dBm/SCS	1,2	-98			
$N_{oc}$ Note 2	dBm/15 kHz	1,2	-98			
$\hat{E}_s / I_{ot}$	dB	1,2	4	-1.46	-Infinity	-1.46
$\hat{E}_s / N_{oc}$	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 $N_{oc}$ 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  $2 \times TTI_{DCCH}$  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 =  $T_{\text{identify\_intra\_with\_index}}$

where,

$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} + T_{\text{SSB\_time\_index\_intra}})$  ms

-  $T_{\text{PSS/SSS\_sync\_intra}} = \max(600\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(600\text{ms}, \text{Ceil}(5 \times 1) \times 20\text{ms}) \times 1 = 600\text{ms}$

-  $T_{\text{SSB\_measurement\_period\_intra}} = \max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(200\text{ms}, \text{ceil}(5 \times 1) \times 20\text{ms}) \times 1 = 200\text{ms}$

- $T_{SSB\_time\_index\_intra} = \max(120\text{ms}, \text{ceil}(3 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra} = \max(120\text{ms}, \text{ceil}(3 \times 1) \times 20\text{ms}) \times 1 = 120\text{ms}$

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
	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	
SMTTC configuration		1,2	SMTTC.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 $\mu$ s	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.2 Table 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-ld1	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	
$N_{oc}$ <sup>Note 2</sup>	dBm/SCS	1,2	-98			
$N_{oc}$ <sup>Note 2</sup>	dBm/15 kHz	1,2	-98			
$\hat{E}_s/I_{ot}$	dB	1,2	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2	4	4	-Infinity	4
SS-RSRP <sup>Note 3</sup>	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 $N_{oc}$ 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  $2 \times TTI_{DCCH}$  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 =  $T_{\text{identify\_intra\_with\_index}}$

where,

$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} + T_{\text{SSB\_time\_index\_intra}})$  ms

$T_{\text{PSS/SSS\_sync\_intra}} = \max(600\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(600\text{ms}, \text{Ceil}(5 \times 1) \times 20\text{ms}) \times 1 = 600\text{ms}$

$T_{\text{SSB\_measurement\_period\_intra}} = \max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(200\text{ms}, \text{ceil}(5 \times 1) \times 20\text{ms}) \times 1 = 200\text{ms}$

$T_{\text{SSB\_time\_index\_intra}} = \max(120\text{ms}, \text{ceil}(3 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}} = \max(120\text{ms}, \text{ceil}(3 \times 1) \times 20\text{ms}) \times 1 = 120\text{ms}$

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
<i>highSpeedMeasFlag-r16</i>		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 $\mu$ s	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.

Parameter	Unit	Test configuration	Value	Comment
		2,5	3 $\mu$ s	Synchronous cells
		3,6	3 $\mu$ s	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	
$N_{oc}$ <small>Note 2</small>	dBm/SCS	1,4			-98	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
$N_{oc}$ <small>Note 2</small>	dBm/15 kHz	2,5	-98			
		3,6	-95			
		1,4	-98			
		2,5	-98			
$\hat{E}_s / I_{ot}$	dB	1,4	4	-1.46	-Infinity	-1.46
		2,5				
		3,6				
$\hat{E}_s / N_{oc}$	dB	1,4	4	4	-Infinity	4
		2,5				
		3,6				
SS-RSRP <small>Note 3</small>	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 <small>Note 4</small>	
		3,6	AWGN		AWGN 3334 Hz <small>Note 5</small>	
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 $N_{oc}$ 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  $T_{\text{identify\_intra\_without\_index}} + 2 \times TTI_{\text{DCCH}}$  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  $2 \times TTI_{\text{DCCH}}$  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:

$T_{\text{identify\_intra\_without\_index}} = T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}}$ , is the measurement reporting delay.

$T_{\text{PSS/SSS\_sync\_intra}} = \text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}} = 3200$  ms, is the time period used in PSS/SSS detection defined in 38.133 [6] clause 9.2.5.1

$T_{\text{SSB\_measurement\_period\_intra}} = \text{ceil}(Y \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}} = 1920$  ms, equal to a measurement period of SSB based measurement defined in 38.133 [6] clause 9.2.5.2.

Where:

$K_p = 1$  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;

$\text{CSSF}_{\text{intra}} = 1$  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.

$TTI_{\text{DCCH}} = 1$  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%.

## 4.6.2 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  $\hat{E}_s/I_{ot}$  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  $T_{\text{identify\_inter\_without\_index}}$  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  $T_{\text{identify\_inter\_with\_index}}$ . The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within  $T_{\text{identify\_inter\_without\_index}}$ .

$$T_{\text{identify\_inter\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter}} + T_{\text{SSB\_measurement\_period\_inter}}) \text{ ms}$$

$$T_{\text{identify\_inter\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter}} + T_{\text{SSB\_measurement\_period\_inter}} + T_{\text{SSB\_time\_index\_inter}}) \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_inter}}$ : it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

$T_{\text{SSB\_time\_index\_inter}}$ : 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.

$T_{\text{SSB\_measurement\_period\_inter}}$ : equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

$\text{CSSF}_{\text{inter}}$ : it is a carrier specific scaling factor and is determined according to  $\text{CSSF}_{\text{within\_gap},i}$  in 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)**

Condition <sup>NOTE1,2</sup>	$T_{\text{PSS/SSS\_sync\_inter}}$
No DRX	$\text{Max}(600\text{ms}, 8 \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{inter}}$
DRX cycle $\leq 320\text{ms}$	$\text{Max}(600\text{ms}, \text{Ceil}(8 \times 1.5) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{inter}}$
DRX cycle $> 320\text{ms}$	$8 \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$

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 9.3.4-3: Time period for time index detection (Frequency range FR1)**

Condition <sup>NOTE1,2</sup>	$T_{\text{SSB\_time\_index\_inter}}$
------------------------------	--------------------------------------

No DRX	$\text{Max}(120\text{ms}, 3 \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{inter}}$
DRX cycle $\leq 320\text{ms}$	$\text{Max}(120\text{ms}, \text{Ceil}(3 \times 1.5) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{inter}}$
DRX cycle $> 320\text{ms}$	$3 \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$
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.	

[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 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 9.3.5-1 and 9.3.5-2:

**Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)**

Condition <sup>NOTE1,2</sup>	$T_{\text{SSB measurement period inter}}$
No DRX	$\text{Max}(200\text{ms}, 8 \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{inter}}$
DRX cycle $\leq 320\text{ms}$	$\text{Max}(200\text{ms}, \text{Ceil}(8 \times 1.5) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{inter}}$
DRX cycle $> 320\text{ms}$	$8 \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$
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.	

[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:  $2 \times T_{\text{TI}_{\text{DCCH}}}$ . 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  $T_{\text{identify\_inter\_without\_index}}$  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  $T_{\text{identify\_inter\_with\_index}}$ . Both  $T_{\text{identify\_inter\_without\_index}}$  and  $T_{\text{identify\_inter\_with\_index}}$  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  $T_{\text{identify\_inter\_without\_index}}$  or  $T_{\text{identify\_inter\_with\_index}}$  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  $T_{\text{SSB\_measurement\_period\_inter}}$  defined in clause 9.3.5 provided the timing to that cell has not changed more than  $\pm 3200 T_c$  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

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
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 $\mu$ s		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 $\mu$ s		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 760 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			
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 106			
BWP BW	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 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			
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						

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$N_{oc}$ <sup>Note2</sup>	dBm/15k Hz		-98		-98	
$N_{oc}$ <sup>Note2</sup>	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP <sup>Note 3</sup>	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$I_o$ <sup>Note3</sup>	dBm/9.36 MHz	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 $N_{oc}$ to be fulfilled.						
NOTE 3: SS-RSRP and $I_o$ 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 760 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  $2xTTI_{DCCH}$  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



Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
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			
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 106			
BWP BW	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 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	
SMTTC configuration		Config 1,4	SMTTC.2		SMTTC.5	
		Config 2,3,5,6	SMTTC.1		SMTTC.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						

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
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)						
$N_{oc}$ <sup>Note2</sup>	dBm/15k Hz		-98		-98	
$N_{oc}$ <sup>Note2</sup>	dBm/SC S	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP <sup>Note 3</sup>	dBm/SC S	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$I_o$ <sup>Note3</sup>	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 $N_{oc}$ to be fulfilled.						
NOTE 3: SS-RSRP and $I_o$ 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  $2 \times TTI_{DCCH}$  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.

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
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 880 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			
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 106			
BWP BW	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 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	



Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
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	
SMTTC configuration		Config 1,4	SMTTC.2		SMTTC.5	
		Config 2,3,5,6	SMTTC.1		SMTTC.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)						
$N_{oc}$ <sup>Note2</sup>	dBm/15kHz					
$N_{oc}$ <sup>Note2</sup>	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP <sup>Note 3</sup>	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$I_{ot}$ <sup>Note3</sup>	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

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
Propagation Condition		Config 1,2,3,4,5,6	AWGN		AWGN	
<p>NOTE 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>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 <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 3: SS-RSRP and <math>I_0</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p>						

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 880 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  $2xTTI_{DCCH}$  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, 13440 ms for Test 2, 1280 ms for Test 3 and 13440 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			
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 106			
BWP BW	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52			
		Config 2,5	10: N <sub>RB,c</sub> = 52			
		Config 3,6	40: N <sub>RB,c</sub> = 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)						
$N_{oc}^{Note2}$	dBm/15kHz					
$N_{oc}^{Note2}$	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP <sup>Note 3</sup>		Config 1,2,4,5	-94	-94	-Infinity	-91

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
	dBm/SCS	Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$I_{Q}$ <sup>Note3</sup>	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 $N_{oc}$ to be fulfilled.						
NOTE 3: SS-RSRP and $I_{Q}$ 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 13440 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 13440 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  $2 \times TTI_{DCCH}$  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

4.6.3 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  $T_{L1-RSRP\_Measurement\_Period\_SSB}$ .

The value of  $T_{L1-RSRP\_Measurement\_Period\_SSB}$  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,

- $P = \frac{1}{1 - \frac{T_{SSB}}{MRGP}}$ , 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:

$T_{SSB}$  = *ssb-periodicityServingCell*

$T_{SMTCperiod}$  = the configured SMTC period

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc1*.  $T_{SMTCperiod}$  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 previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period  $T_{identify\_CGI}$  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  $T_{identify\_CGLE-UTRAN}$  when the UE is requested to decode an LTE CGI.

**Table 9.5.4.1-1: Measurement period  $T_{L1-RSRP\_Measurement\_Period\_SSB}$  for FR1**

Configuration	$T_{L1-RSRP\_Measurement\_Period\_SSB}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{SSB})$
DRX cycle $\leq 320$ ms	$\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{SSB}))$
DRX cycle $> 320$ ms	$\text{ceil}(M \cdot P) \cdot T_{DRX}$
NOTE 1: $T_{SSB}$ = <i>ssb-periodicityServingCell</i> is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.	
NOTE 2: $K = 1$ when $T_{SSB} \leq 40$ ms and <i>highSpeedMeasFlag-r16</i> are configured; otherwise $K = 1.5$ .	

**Commented [AvT1]:** I presume it has been copied from another document. Please specify which one [3GPP TS XX.XXX clause 9.5.4.1]

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  $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$ .

The value of  $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$  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,  $N=\text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  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,  $N=\text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  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,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{M_{\text{GRP}}}}$ , 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:

$T_{\text{CSI-RS}}$  = 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 previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period  $T_{\text{identify\_CGI}}$  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  $T_{\text{identify\_CGLE-UTRAN}}$  when the UE is requested to decode an LTE CGI.

**Table 9.5.4.2-1: Measurement period  $T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$  for FR1**

Configuration	$T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$ (ms)
non-DRX	$\max(T_{\text{Report}}, \text{ceil}(M \cdot P) \cdot T_{\text{CSI-RS}})$
DRX cycle $\leq 320$ ms	$\max(T_{\text{Report}}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $> 320$ ms	$\text{ceil}(M \cdot P) \cdot T_{\text{DRX}}$
NOTE 1: $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ 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 $T_{\text{CSI-RS}} \leq 40$ ms and <i>highSpeedMeasFlag-r16</i> are configured; otherwise $K = 1.5$ .	

**Commented [AvT2]:** I presume it has been copied from another document. Please specify which one [3GPP TS XX.XXX clause 9.5.4.1]

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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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			

Parameter	Config	Unit	Value
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 <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
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 DUT Part	As specified in TS 38.508-1 [14] Annex A.
	A.3.1.7.1 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	1 entry		
SEQUENCE			
(SIZE(1..maxNrofFailureDetectionResources)) OF			
SEQUENCE {			
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
$N_{oc}$ <sup>Note2</sup>	1~6	dBm/15kHz	-94.65			
$N_{oc}$ <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-94.65			
	3,6		-91.65			
$\hat{E}_s/I_{ot}$	1~6	dB	0	0	-Infinity	3.5
SSB RSRP <sup>Note3</sup>	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3,6		-91.65	-91.65	-Infinity	-88.14
$I_o$ <sup>Note3</sup>	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
$\hat{E}_s/N_{oc}$	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  $2xTTI_{DCH}$  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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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



Parameter	Config	Unit	Value
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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
Propagation condition			

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 DUT Part	A.3.1.7.1 A.3.2.3.4 As specified in TS 38.508-1 [14] Annex A.
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
$N_{oc}$ <sup>Note2</sup>	1-6	dBm/15kHz	-94.65			
$N_{oc}$ <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-94.65			
	3,6		-91.65			
$\hat{E}_s/I_{tot}$	1-6	dB	0	0	-Infinity	3.5
SSB RSRP <sup>Note3</sup>	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3,6		-91.65	-91.65	-Infinity	-88.14
$I_o$ <sup>Note3</sup>	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
$\hat{E}_s/N_{oc}$	1-6	dB		0	0	-Infinity

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  $N_{oc}$  to be fulfilled.  
NOTE 3: SS-RSRP and  $I_o$  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  $2 \times TTI_{DCCH}$  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
	1,4		FDD
Duplex mode	2,5		TDD
	3,6		TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
	1,4		N/A
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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

Parameter	Config	Unit	Value
SSB configuration	3,6		CCR.2.1 TDD
	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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
Propagation condition			

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	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	
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 4 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	1 entry		
SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF			
SEQUENCE {			
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
$N_{oc}$ <sup>Note1</sup>	1-6	dBm/15kHz	-94.65	
$N_{oc}$ <sup>Note1</sup>	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s/I_{ot}$	1-6	dB	0	3.5
CSI-RS RSRP <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-94.65	-91.15
	3,6		-91.65	-88.14
$I_o$ <sup>Note2</sup>	1,2,4,5	dBm/9.36 MHz	-63.69	-61.59
	3,6		-57.59	-55.49
$\hat{E}_s/N_{oc}$	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 $N_{oc}$ to be fulfilled.				
NOTE 3: CSI-RS RSRP and $I_o$ 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 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  $2 \times TTI_{DCCH}$  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 4.6.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.4.1-2. Test environment parameters are given in Table 4.4.1-3.

**Table 4.6.4.4.1-1: 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 4.6.4.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement in DRX**

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1

Parameter	Config	Unit	Value
BW <sub>channel</sub>	3,6	MHz	TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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
SMTTC configuration	1~6		SMTTC.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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
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

#### 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
$N_{oc}$ <sup>Note1</sup>	1-6	dBm/15kHz	-94.65	
$N_{oc}$ <sup>Note1</sup>	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s/I_{ot}$	1-6	dB	0	3.5
CSI-RS RSRP <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-94.65	-91.15
	3,6		-91.65	-88.14
$I_o$ <sup>Note2</sup>	1,2,4,5	dBm/9.36 MHz	-63.69	-61.59
	3,6	dBm/38.16 MHz	-57.59	-55.49

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
$\hat{E}_s / N_{oc}$	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 $N_{oc}$ to be fulfilled.				
NOTE 3: CSI-RS RSRP and $I_o$ 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 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  $2 \times TTI_{DCCH}$  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

##### 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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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

Parameter	Config	Unit	Value
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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
Propagation condition			
	3,6		AWGN 3334 Hz
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 700 ms for configuration 1, 2, 4 and 5 and no later than 660 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
$N_{oc}$ <small>Note2</small>	1-6	dBm/15kHz			-94.65	
	1,2,4,5	dBm/SSB SCS			-94.65	

$N_{oc}$ <sup>Note2</sup>	3,6		-91.65			
$\hat{E}_s/I_{ot}$	1~6	dB	0	0	-Infinity	3.5
SSB RSRP <sup>Note3</sup>	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3,6		-91.65	-91.65	-Infinity	-88.15
$I_o$ <sup>Note3</sup>	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
$\hat{E}_s/N_{oc}$	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 $N_{oc}$ to be fulfilled.						
NOTE 3: SS-RSRP and $I_o$ 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 620ms 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  $2 \times TTI_{DCCH}$  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  $T_{SRS\_RSRP\_measurement\_period}$  for FR1 and FR2.

**Table 4.6.5.0.1-1 Measurement period  $T_{\text{SRS\_RSRP\_measurement\_period}}$** 

Configuration	$T_{\text{SRS\_measurement\_period}}$ (ms)
No DRX	$\text{Max}(60, 3 \times T_{\text{SRS}})$
DRX cycle $\leq 320\text{ms}$	$\text{Max}(60, \text{Ceil}(1.5 \times 3) \times \text{max}(T_{\text{SRS}}, T_{\text{DRX}}))$
DRX cycle $> 320\text{ms}$	$3 \times T_{\text{DRX}}$
NOTE: $T_{\text{SRS}}$ is SRS measurement periodicity configured <i>SRS-PeriodicityAndOffset</i> , and $T_{\text{DRX}}$ 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  $T_{\text{SRS\_RSRP\_measurement\_period}}$ .

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCL*. 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<sub>RP</sub> and SRS<sub>ES</sub>/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:  $2 \times \text{TTI}_{\text{DCCH}}$ . 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  $T_{\text{CLI\_RSSI\_measurement\_period}}$ . 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  $T_{\text{CLI\_RSSI\_measurement\_period}}$  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  $T_{\text{CLI\_RSSI\_measurement\_period}}$ .

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 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:  $2 \times T_{DCCH}$ . 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:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure might need update.
- Test applicability needs to be updated

##### 4.6.5.1.1 Test purpose

To verify that the UE makes correct reporting of SRS-RSRP measurement within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5.

##### 4.6.5.1.2 Test applicability

FFS.

##### 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

###### 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. Configure the test equipment and the DUT according to the parameters in Table 4.6.5.1.4.1-2. Test environment parameters are given in Table 4.6.5.1.4.1-3.

**Table 4.6.5.1.4.1-1: EN-DC FR1 SRS-RSRP measurement supported test configurations**

Configuration	Description
1	NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
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.

**Table 4.6.5.1.4.1-2: General test parameters for EN-DC SRS-RSRP 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	
SRS configuration		1	SRSCConf.1	Table 4.6.5.1.5-3
		2	SRSCConf.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	

**Table 4.6.5.1.4.1-3: Test Environment parameters for EN-DC SRS-RSRP event triggered reporting 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.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 4.6.5.1.4.3.
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 SRS-RSRP 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. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

#### 4.6.5.1.4.2 Test procedure

FFS

#### 4.6.5.1.4.3 Message contents

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

FFS

#### 4.6.5.1.5 Test requirement

Table 4.6.5.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.5.1.5-1: NR Cell specific test parameters for EN-DC SRS-RSRP event triggered reporting for PSCell in FR1**

Parameter	Unit	Test configuration	Cell 2	
			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 configuration		1	CR.1.1 TDD	
		2	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 TDD	
		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	
$N_{oc}$ <sup>Note 2</sup>	dBm/15 kHz	1	-98+TT	
		2		
$N_{oc}$ <sup>Note 2</sup>	dBm/SCS	1	-98+TT	
		2	-95+TT	
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 $N_{oc}$ to be fulfilled.				

**Table 4.6.5.1.5-2: NR Cell specific test parameters for EN-DC FR1 SRS-RSRP event triggered reporting for neighbour cell UE**

Parameter	Unit	Test configuration	Neighbour cell UE	
			T1	T2
$N_{oc}$ <sup>Note 2</sup>	dBm/15 kHz	1	-98+TT	
		2		
$N_{oc}$ <sup>Note 2</sup>	dBm/SCS	1	-98+TT	
		2	-95+TT	
$\hat{E}_s/I_{ot}$	dB	1	-infinity	4+TT
		2		
$\hat{E}_s/N_{oc}$	dB	1	-infinity	4+TT
		2		
SRS-RSRP <sup>Note 3</sup>	dBm/SCS kHz	1	-infinity	-94+TT
		2	-infinity	-91+TT
I <sub>o</sub>	dBm/9.36 MHz	1	-70.05+TT	-64.59+TT
	dBm/38.16 MHz	2	-63.96+TT	-58.50+TT
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 $N_{oc}$ 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 configuration for measurement reporting

	Field	SRSCnf.1	SRSCnf.2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceSetList	0	0	
	resourceType	Periodic	Periodic	
	usage	Codebook	Codebook	
SRS-Resource	SRS-ResourceId	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping	0	0	
	startPosition			
	resourceMapping	n1	n1	
	nrofSymbols			
	resourceMapping	n1	n1	
	repetitionFactor			
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping	12	12	
	c-SRS			
	freqHopping	0	0	
	b-SRS			
	freqHopping	0	0	
b-hop				
groupOrSequenceHopping	Neither	Neither		
resourceType	Periodic	Periodic		
periodicityAndOffset	sl20, 9	sl40, 19		
sequenceId	0	0	Any 10 bit number	

The UE shall send one Event 11 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  $2xTTI_{DCCH}$  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 OCNB 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 configuration	Cell 2	
			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 configuration		1	CR.1.1 TDD	
		2	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 TDD	
		2	CCR.2.1 TDD	
OCNG Patterns <sup>Note 3</sup>		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	
$N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>	dBm/15 kHz	1	-116	-108
$N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>	dBm/SCS	1	-116	-108
		2	-113	-105
Io on CLI-RSSI measurement resource	dBm/9.36 MHz	1	-88.05	79.55
Io on CLI-RSSI measurement resource	dBm/38.16 MHz	2	-81.96	73.5
Io on CLI-RSSI measurement resource	dBm/1.08 MHz	1	-97.43	88.93
Io on CLI-RSSI 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 $N_{oc}$ 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-Resource	rssI-ResourceId	0	0
	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 I<sub>o</sub>.

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  $2 \times T_{TTI_{DCCH}}$  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  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ .

The value of  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$  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,

- $P = \frac{1}{1 - \frac{T_{CSI-RS}}{MRGP}}$ , 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:

$T_{SMTCperiod}$  = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI-RS}$  = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{SMTCperiod}$  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 previous conditions.

**Table 9.8.4.1-1: Measurement period  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$  for FR1**

Configuration	$T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{CSI-RS})$
DRX cycle $\leq 320$ ms	$\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{CSI-RS}))$
DRX cycle $> 320$ ms	$\text{ceil}(M \cdot P) \cdot T_{DRX}$
Note 1:	$T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ 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  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ .

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  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  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  $P_{CMR}$  and  $P_{IMR}$ , i.e.,  $P = \max(P_{CMR}, P_{IMR})$ , where

- the value of  $P_{CMR}$  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  $P_{IMR}$  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 previous 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  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  for FR1**

Configuration	$T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{SSB})$
DRX cycle $\leq$ 320ms	$\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{SSB}))$
DRX cycle $>$ 320ms	$\text{ceil}(M \cdot P) \cdot T_{DRX}$
Note 1:	$T_{SSB} = \text{ssb-periodicityServingCell}$ is the periodicity of the SSB-Index configured for L1-SINR channel measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ 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  $T_{L1}$ .

$T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ .

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  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$  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  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$ , i.e.,  $P = \max(P_{\text{CMR}}, P_{\text{IMR}})$ , where

- The value of  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$  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 previous 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  $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}}$  for FR1**

Configuration	$T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}}$ (ms)
non-DRX	$\max(T_{\text{Report}}, \text{ceil}(M \cdot P) \cdot T_{\text{CSI-RS}})$
DRX cycle $\leq$ 320ms	$\max(T_{\text{Report}}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $>$ 320ms	$\text{ceil}(M \cdot P) \cdot T_{\text{DRX}}$
Note 1:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ 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
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
	1,4		
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		10: N <sub>RB,c</sub> = 52
	1,4		40: N <sub>RB,c</sub> = 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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
Propagation condition			
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 *RRConnectionReconfiguration* 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 *RRConnectionReconfigurationComplete* 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	1 entry		
SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF			
SEQUENCE {			
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
$N_{oc}$ <sup>Note1</sup>	1~6	dBm/15kHz	-94.65	
$N_{oc}$ <sup>Note1</sup>	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s/I_{ot}$	1~6	dB	0	3
CSI-RS RSRP <sup>Note3</sup>	1,2,4,5	dBm/SSB SCS	-94.65	-91.65
	3,6		-91.65	-88.65
$I_o$ <sup>Note2</sup>	1,2,4,5	dBm/9.36 MHz	-63.69	-61.93
	3,6	dBm/38.16 MHz	-57.59	-55.84
$\hat{E}_s/N_{oc}$	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 $N_{oc}$ to be fulfilled. Note 3: CSI-RS RSRP and $I_o$ 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  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

#### 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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
Propagation condition			

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 { purpose	1 entry		
	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

$N_{oc}$ <sup>Note2</sup>	1~6	dBm/15kHz	-94.65+TT			
$N_{oc}$ <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-94.65+TT			
	3,6		-91.65+TT			
$\hat{E}_s/I_{ot}$	1~6	dB	0+TT	0+TT	0+TT	0+TT
SS-RSRP <sup>Note3</sup>	1,2,4,5	dBm/SSB SCS	-	-	-	-
	3,6		94.65+TT	94.65+TT	94.65+TT	94.65+TT
$I_o$ <sup>Note3</sup>	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
$\hat{E}_s/N_{oc}$	1~6	dB	0+TT	0+TT	0+TT	0+TT
<p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>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 <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p>						

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  $2xTTI_{DCH}$  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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
Propagation condition			
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
$N_{oc}$ <sup>Note1</sup>	1~6	dBm/15kHz	-94.65	
$N_{oc}$ <sup>Note1</sup>	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s/I_{ot}$	1~6	dB	0.5	3
$\hat{E}_s/N_{oc}$	1~6	dB	0.5	3
CSI-RS RSRP <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-94.15	-91.65
	3,6		-91.14	-88.65
$I_o$ <sup>Note2</sup>	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 $N_{oc}$ to be fulfilled. Note 2: CSI-RS RSRP and $I_o$ 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  $2 \times TTI_{DCCH}$  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 Es/lot	NR operating band groups Note 2	Io <sup>Note 1</sup> range			
				Minimum Io		Maximum Io	
dB	dB	dB		dBm / SCS <sub>SSB</sub>		dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
				SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 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_127 <sup>1</sup>	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 $\hat{E}_s/\text{lot}$ Note 2	$I_o$ Note 1 range				
			NR operating band groups Note 4	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$			dBm/BW <sub>channel</sub>
			$SCS_{SSB} =$ 15 kHz	$SCS_{SSB} =$ 30 kHz			
$\pm 2$	$\pm 3$	$\geq -3$	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
$\pm 3$	$\pm 3$	$\geq -6$	Note 3	Note 3	Note 3	Note 3	Note 3

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_o$  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 Es/lot Note 2	Io <sup>Note 1</sup> range				
			NR operating band groups Note 3	Minimum Io		Maximum Io	
dB	dB	dB		dBm / SCS <sub>SSB</sub>		dBm/BW <sub>channel</sub>	dBm/BW <sub>channel</sub>
			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 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 FR1 compared 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,

$$\left| RSRP1 \Big|_{dBm} - RSRP2 \Big|_{dBm} \right| \leq 27 dB$$

- |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 $\bar{E}_s/\text{lot}$ Note 2	$I_o$ Note 1 range				
			NR operating band groups Note 3	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$		dBm/ $BW_{\text{channel}}$	dBm/ $BW_{\text{channel}}$
			$SCS_{SSB} = 15 \text{ kHz}$	$SCS_{SSB} = 30 \text{ kHz}$			
$\pm 4.5$	$\pm 6$	$\geq 6$	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:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\bar{E}_s/\text{lot}$  is the minimum SSB  $\bar{E}_s/\text{lot}$  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 4.7.1.1.4.1-1.



**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 $\varphi_1 = 5$ Hz
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\varphi_{1,1} = 5$ Hz, $\varphi_{1,2} = 10$ Hz, $\varphi_{1,3} = 15$ 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					
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52					
	Config 2,5		10: N <sub>RB,c</sub> = 52					
	Config 3,6		40: N <sub>RB,c</sub> = 106					
BWP BW	Config 1,4		10: N <sub>RB,c</sub> = 52					
	Config 2,5		10: N <sub>RB,c</sub> = 52					
	Config 3,6		40: N <sub>RB,c</sub> = 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		CCR2.1 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					

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
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)									
$N_{oc}$ Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-107.5		-88		-116 + $\Delta_{BG\_offset}$	
	Config 3,6	Depending on band group		-113.8		-94		-116 + $\Delta_{BG\_offset}$	
$N_{oc}$ Note2	Config 1,2,4,5	Depending on band group	dBm/SCS	-107.4		-88		Same as $N_{oc}/15kHz$	
	Config 3,6			-110.8		-91		-113 + $\Delta_{BG\_offset}$	
$\hat{E}_s/I_{ot}$			dB	1.88	-5.57	1.88	-5.57	0.09	-5.56
$\hat{E}_s/N_{oc}$			dB	6	1.4	6	1.4	3	-0.8
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-101.5	-106.1	-82	-86.6	-113 + $\Delta_{BG\_offset}$	-116.8 + $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group		-104.8	-109.4	-85	-89.6	-110 + $\Delta_{BG\_offset}$	-113.8 + $\Delta_{BG\_offset}$
$I_o$ Note3	Config 1,2,4,5	Depending on band group	dBm/9.36MHz	-71.68		-52.18		-82.39 + $\Delta_{BG\_offset}$	
	Config 3,6	Depending on band group	dBm/38.16MHz	-71.71		-51.91		-76.12 + $\Delta_{BG\_offset}$	
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 $N_{oc}$ to be fulfilled.									
NOTE 3: SS-RSRP and $I_o$ 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: $\Delta_{BG\_offset}$ 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

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3	
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 $\phi_1 = 5$ Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\phi_{1,1} = 5$ Hz, $\phi_{1,2} = 10$ Hz, $\phi_{1,3} = 15$ 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
$N_{oc}$ <sup>Note2</sup>	Config 1,2,4,5	Depending on band group	dBm/15kHz	-106		-88		-116 + $\Delta_{BG\_offset}$	
	Config 3,6	Depending on band group		-113		-94		-116 + $\Delta_{BG\_offset}$	
$N_{oc}$ <sup>Note2</sup>	Config 1,2,4,5	Depending on band group	dBm/SCS	Same as Noc/15kHz		Same as Noc/15kHz		Same as Noc/15kHz	
	Config 3,6			-110		-91		-113 + $\Delta_{BG\_offset}$	
$\hat{E}_s/I_{ot}$			dB	1.88	-4.97	1.88	-4.97	-0.01	-4.76
$\hat{E}_s/N_{oc}$			dB	6	2	6	2	3	0
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5	Depending on band group	dBm/SCS	-100	-104	-82	-86	-113 + $\Delta_{BG\_offset}$	-116 + $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group		-104	-108	-85	-89	-110 + $\Delta_{BG\_offset}$	-113 + $\Delta_{BG\_offset}$
$I_{o}$ <sup>Note3</sup>	Config 1,2,4,5	Depending on band group	dBm/9.36MHz	-70.05		-52.05		-82.20 + $\Delta_{BG\_offset}$	
	Config 3,6	Depending on band group	dBm/38.16MHz	-70.77		-51.77		-75.93 + $\Delta_{BG\_offset}$	

**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 $\phi_1 = 5$ Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\phi_{1,1} = 5$ Hz, $\phi_{1,2} = 10$ Hz, $\phi_{1,3} = 15$ 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	
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52		10: N <sub>RB,c</sub> = 52		
	2,5		10: N <sub>RB,c</sub> = 52		10: N <sub>RB,c</sub> = 52		
	3,6		40: N <sub>RB,c</sub> = 106		40: N <sub>RB,c</sub> = 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 SSS <sup>Note 1</sup>							
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>							
$N_{oc}$ <sup>Note 2</sup>							Depending on band group

Parameter	Config	Unit	Test 1		Test 2		
			Cell 2	Cell 3	Cell 2	Cell 3	
$N_{oc}$ <sup>Note2</sup>	Depending on band group	3,6	dBm/15k Hz	-96	-96	( $N_{oc}$ for Cell 3 +8dB)	-115+ $\Delta_{BG\_offset}$
$N_{oc}$ <sup>Note2</sup>	Depending on band group	1,2,4,5	dBm/SS B SCS	-94.65	-94.65	( $N_{oc}$ for Cell 3 +8dB)	-115+ $\Delta_{BG\_offset}$
	Depending on band group	3,6		-93	-93	( $N_{oc}$ for C 3 +8dB)	-112.00+ $\Delta_{BG\_offset}$
$\hat{E}_s/I_{ot}$	1-6		dB	10	10	13	-3
SS-RSRP <sup>Note3</sup>	Depending on band group	1,2,4,5	dBm/SC S	-84.65	84.65	(RSRP for Cell 3 +25dB)	-118.00+ $\Delta_{BG\_offset}$
	Depending on band group	3,6		-83	-83	(RSRP for Cell 3 +25dB)	-115.00+ $\Delta_{BG\_offset}$
$I_o$ <sup>Note3</sup>	Depending on band group	1,2,4,5	dBm/9.36MHz	56.28	56.28	( $I_o$ for Channel 3 +19.75dB)	-85.28+ $\Delta_{BG\_offset}$
	Depending on band group	3,6		38.16MHz	-51.53	-51.53	( $I_o$ for Channel 3 +19.75dB)
$\hat{E}_s/N_{oc}$	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 $N_{oc}$ to be fulfilled.							
NOTE 3: RSRP and $I_o$ 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: $\Delta_{BG\_offset}$ 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
<b>Extreme Conditions</b>	<b>Test 1 All bands</b>	<b>Test 2</b>	
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
<b>Extreme Conditions</b>	<b>Test 1 All bands</b>	<b>Test 2</b>	
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 $\varphi_1 = 5$ Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\varphi_{1,1} = 5$ Hz, $\varphi_{1,2} = 10$ Hz, $\varphi_{1,3} = 15$ 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 <sub>x</sub> - 7	SS-RSRP <sub>x</sub> - 31
Highest reported value (Cell 3)	SS-RSRP <sub>x</sub> + 7	SS-RSRP <sub>x</sub> - 18
Extreme Conditions		
Lowest reported value (Cell 3)	SS-RSRP <sub>x</sub> - 9	SS-RSRP <sub>x</sub> - 33
Highest reported value (Cell 3)	SS-RSRP <sub>x</sub> + 9	SS-RSRP <sub>x</sub> - 17
SS-RSRP <sub>x</sub> 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 $\hat{E}_s/\text{lot}$	$I_o$ <sup>Note 1</sup> range				
			NR operating band groups <sup>Note 3</sup>	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$		dBm/ $BW_{\text{channel}}$	
			$SCS_{SSB} = 15$ kHz	$SCS_{SSB} = 30$ kHz	dBm/ $BW_{\text{channel}}$		
$\pm 2.5$	$\pm 4$	$\geq -3$ 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
$\pm 3.5$	$\pm 4$	$\geq -6$ dB	Note 2	Note 2	Note 2	Note 2	Note 2

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  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 $\leq$ SS-RSRQ < -42.5	dB
SS-RSRQ_2	-42.5 $\leq$ SS-RSRQ < -42	dB
SS-RSRQ_3	-42 $\leq$ SS-RSRQ < -41.5	dB
SS-RSRQ_4	-41.5 $\leq$ SS-RSRQ < -41	dB
..	..	...
SS-RSRQ_122	17.5 $\leq$ SS-RSRQ < 18	dB
SS-RSRQ_123	18 $\leq$ SS-RSRQ < 18.5	dB
SS-RSRQ_124	18.5 $\leq$ SS-RSRQ < 19	dB
SS-RSRQ_125	19 $\leq$ SS-RSRQ < 19.5	dB
SS-RSRQ_126	19.5 $\leq$ SS-RSRQ < 20	dB
SS-RSRQ_127	20 $\leq$ 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 Es/lot	Io <sup>Note 1</sup> range				
			NR operating band groups <sup>Note 3</sup>	Minimum Io		Maximum Io	
dB	dB	dB		dBm / SCS <sub>SSB</sub>		dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 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 FR1 compared 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.
- $|\text{SSB\_RP1}_{\text{dBm}} - \text{SSB\_RP2}_{\text{dBm}}| \leq 27$  dB
- $|\text{Channel 1\_Io} - \text{Channel 2\_Io}| \leq 20$  dB

Table 4.7.2.0.3-1: SS-RSRQ Inter frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB $\hat{E}_s/\text{lot}$ Note 2	NR operating band groups Note 4	$l_o$ Note 1 range			
				Minimum $l_o$		Maximum $l_o$	
dB	dB	dB		dBm / $SCS_{SSB}$		dBm/ $BW_{\text{channel}}$	dBm/ $BW_{\text{channel}}$
				$SCS_{SSB} = 15 \text{ kHz}$	$SCS_{SSB} = 30 \text{ kHz}$		
$\pm 3$	$\pm 4$	$\geq -3 \text{ dB}$	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
$\pm 4$	$\pm 4$	$\geq -6 \text{ dB}$	Note 3	Note 3	Note 3	Note 3	Note 3

NOTE 1:  $l_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $l_o$  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 $\varphi_1 = 5$ Hz
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\varphi_{1,1} = 5$ Hz, $\varphi_{1,2} = 10$ Hz, $\varphi_{1,3} = 15$ 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					
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52					
	Config 2,5		10: N <sub>RB,c</sub> = 52					
	Config 3,6		40: N <sub>RB,c</sub> = 106					

Parameter		Unit	Test 1		Test 2		Test 3		
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3	
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		SMT.C.1						
	Config 1,4		SMT.C.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)									
$N_{oc}$ Note2	Config 1,2,4,5	dBm/15k	-86.5		-101		-114+ $\Delta_{BG\_offset}$		
	Config 3,6	Hz	-92.6		-		-114+ $\Delta_{BG\_offset}$		
$N_{oc}$ Note2	Config 1,2,4,5	dBm/SC	-86.5		-101		-114+ $\Delta_{BG\_offset}$		
	Config 3,6	S	-89.6		-		-111+ $\Delta_{BG\_offset}$		
$\hat{E}_s/I_{ot}$		dB	-1.76		-4.7		-5.46	-5.46	
$\hat{E}_s/N_{oc}$		dB	3	3	-2.9	-2.9	-4	-4	
SS-RSRP <sub>test3</sub>	Config 1,2,4,5	Depending on band group	dBm/SCS	-83.5	-83.5	-103.9	-103.9	-	-118+ $\Delta_{BG\_offset}$

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
Config 3,6	Depending on band group			-86.6	-86.6	-	-	-115+	-115+
								$\Delta_{BG\_offset}$	$\Delta_{BG\_offset}$
SS-RSRQ <sup>Note3</sup>			dB	-14.77	-14.77	-16.76	-16.76	-17.34	-17.34
Io <sup>Note3</sup>	Depending on band group	Depending on band group	dBm/ 9.36MHz	-51.57		-70		-83.50+ $\Delta_{BG\_offset}$	
				-51.56		-		-77.40+ $\Delta_{BG\_offset}$	
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 $N_{rc}$ 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: $\Delta_{BG\_offset}$ 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 $\phi_1 = 5$ Hz
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\phi_{1,1} = 5$ Hz, $\phi_{1,2} = 10$ Hz, $\phi_{1,3} = 15$ 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					
BW <sub>channel</sub>	Config 1,4	10: N <sub>RB,c</sub> = 52					
	Config 2,5	10: N <sub>RB,c</sub> = 52					
	Config 3,6	40: N <sub>RB,c</sub> = 106					
Gap pattern ID	Config 1-6	0					
BWP configuration	Initial DL BWP	DLBWP.0.1					



Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
	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			0	0	0	0	0	0
EPRE ratio of PBCH to PBCH DMRS			0	0	0	0	0	0
EPRE ratio of PDCCH DMRS to SSS			0	0	0	0	0	0
EPRE ratio of PDCCH to PDCCH DMRS			0	0	0	0	0	0
EPRE ratio of PDSCH DMRS to SSS			0	0	0	0	0	0
EPRE ratio of PDSCH to PDSCH			0	0	0	0	0	0
EPRE ratio of OCNG DMRS to SSS(Note 1)			0	0	0	0	0	0
EPRE ratio of OCNG to OCNG DMRS (Note 1)		0	0	0	0	0	0	
$N_{oc}$ <sup>Note2</sup>	Config 1,2,4,5	Depending on band group	-81.68	-81.68	-106	-106	-116 + $\Delta_{BG\_offset}$	-116 + $\Delta_{BG\_offset}$
$N_{oc}$ <sup>Note2</sup>	Config 3,6	Depending on band group	-87.80	-87.80	-113	-113	-116 + $\Delta_{BG\_offset}$	-116 + $\Delta_{BG\_offset}$
$N_{oc}$ <sup>Note2</sup>	Config 1,2,4,5	Depending on band group	-81.68	-81.68	-106	-106	-116 + $\Delta_{BG\_offset}$	-116 + $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group	-84.8	-84.8	-110	-110	-113 + $\Delta_{BG\_offset}$	-113 + $\Delta_{BG\_offset}$
$\hat{E}_s/I_{tot}$		dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
$\hat{E}_s/N_{oc}$		dB	-1.75	-1.75	-1.75	-1.75	3	-1.75

Parameter		Unit	Test 1		Test 2		Test 3		
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3	
SS-RSRP <sup>Note 3</sup>	Config 1,2,4,5	Depending on band group	dBm/SCS	-83.43	-83.43	-107.75	-107.75	-113+ $\Delta_{BG\_offset}$	- 117.75+ $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group		-86.54	-86.54	-111.75	-111.75	-110+ $\Delta_{BG\_offset}$	- 114.75+ $\Delta_{BG\_offset}$
SS-RSRQ <sup>Note 3</sup>			dB	-14.76	-14.76	-14.76	-14.76	-12.56	-14.76
Io <sup>Note 3</sup>	Config 1,2,4,5	Depending on band group	dBm/Ch BW	-51.51	-51.51	-75.83	-75.83	-83.28+ $\Delta_{BG\_offset}$	- 85.83+ $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group		-51.52	-51.52	-76.73	-76.73	-77.19+ $\Delta_{BG\_offset}$	- 79.73+ $\Delta_{BG\_offset}$
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 $N_{DC}$ 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: $\Delta_{BG\_offset}$ 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	As specified in TS 38.508-1 [14] Annex A.	
			A.3.1.8.2 with $n = 2$ and $\phi_1 = 5$ Hz
	TE Part 4Rx		A.3.1.8.5 with $n = 2$ and $\phi_{1,1} = 5$ Hz, $\phi_{1,2} = 10$ Hz, $\phi_{1,3} = 15$ Hz
			A.3.2.3.4
	DUT Part 2Rx		
	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 4.7.2.2.5-2 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 4.7.2.2.5-1 as appropriate and repeat steps 5-7.

#### 4.7.2.2.4.3 Message contents

Message contents are same as in clause 4.7.2.2.1.4.3.

#### 4.7.2.2.5 Test requirement

Table 4.7.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.5-2.

**Table 4.7.2.2.5-1: same as Table 4.7.2.2.1.5-1**

**Table 4.7.2.2.5-2: 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 <sub>x</sub> - 7	SS-RSRQ <sub>x</sub> - 7	SS-RSRQ <sub>x</sub> - 11
Highest reported value (Cell 3)	SS-RSRQ <sub>x</sub> + 7	SS-RSRQ <sub>x</sub> + 7	SS-RSRQ <sub>x</sub> + 2
Extreme Conditions			
Lowest reported value (Cell 3)	SS-RSRQ <sub>x</sub> - 9	SS-RSRQ <sub>x</sub> - 9	SS-RSRQ <sub>x</sub> - 13
Highest reported value (Cell 3)	SS-RSRQ <sub>x</sub> + 9	SS-RSRQ <sub>x</sub> + 9	SS-RSRQ <sub>x</sub> + 4
RSRQ <sub>x</sub> 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 $\hat{E}_s/\text{lot}$ Note 3	$I_o$ Note 1 range				
			NR operating band groups Note 4	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$		dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
			$SCS_{SSB} = 15$ kHz	$SCS_{SSB} = 30$ kHz			
$\pm 3.0$	$\pm 4$	$\geq -3$ 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, NR_TDD_FR1_H	-118	-115	N/A	-50
$\pm 3.5$	$\pm 4$	$\geq -6$ dB	Note 2	Note 2	Note 2	Note 2	Note 2

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25$  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 $\hat{E}_s/\text{lot}$ Note 3	$I_o$ Note 1 range				
			NR operating band groups Note 4	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$			dBm/BW <sub>Channel</sub>
			$SCS_{SSB} = 15$ kHz	$SCS_{SSB} = 30$ kHz			
$\pm 3.0$	$\pm 4$	$\geq -3$ 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
$\pm 3.5$	$\pm 4$	$\geq -6$ dB	Note 2	Note 2	Note 2	Note 2	Note 2

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25$  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 FR1 compared 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.
- $|\text{SSB\_RP1}_{dBm} - \text{SSB\_RP2}_{dBm}| \leq 27$  dB
- $|\text{Channel 1}_{I_o} - \text{Channel 2}_{I_o}| \leq 20$  dB

Table 4.7.3.0.3-1: SS-SINR Inter frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB $\hat{E}_s/\text{lot}$ Note 2,4	$I_o$ Note 1 range				
			NR operating band groups Note 5	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$			dBm/BW <sub>Channel</sub>
			$SCS_{SSB} = 120$ kHz	$SCS_{SSB} = 240$ kHz			
$\pm 3.5$	$\pm 4$	$\geq -3$ 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: $I_0$ is assumed to have constant EPRE across the bandwidth.							
NOTE 2: The parameter SSB $\hat{E}_s/\text{lot}$ is the minimum SSB $\hat{E}_s/\text{lot}$ of the pair of cells to which the requirement applies.							
NOTE 3: The same bands and the same $I_0$ conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.							
NOTE 4: The requirements apply for SSB $\hat{E}_s/\text{lot} \leq [25]$ 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 $\varphi_1 = 5$ Hz
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\varphi_{1,1} = 5$ Hz, $\varphi_{1,2} = 10$ Hz, $\varphi_{1,3} = 15$ 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		SR.2.1 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			

Parameter		Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
SS-RSSI-Measurement			Not Applicable			
Time offset with Cell 2	Config 2,3,5,6	$\mu\text{s}$	-	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)						
$N_{oc}$ <sup>Note2</sup>	Depending on band group	dBm/15kHz	-93		$-116 + \Delta_{BG\_offset}$	
$N_{oc}$ <sup>Note2</sup>	Config 1,2,4,5	dBm/SCS	-93.2		Same as $N_{oc}$ for 15kHz	
	Config 3,6		-90.2		$-113 + \Delta_{BG\_offset}$	
$\hat{E}_s / I_{ot}$		dB	0	-3.19	-5.46	-5.46
$\hat{E}_s / N_{oc}$		dB	4.54	2.66	-3.5	-3.5
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5	dBm/SCS	-88.46	-90.34	$-119.5 + \Delta_{BG\_offset}$	$-119.5 + \Delta_{BG\_offset}$
	Config 3,6		-85.65	-87.53	$-116.5 + \Delta_{BG\_offset}$	$-116.5 + \Delta_{BG\_offset}$
SS-SINR <sup>Note3</sup>		dB	0	-3.19	-5.1	-5.1
$I_o$ <sup>Note3</sup>	Config 1,2,4,5	dBm/9.36MHz	-57.5		$-85.28 + \Delta_{BG\_offset}$	
	Config 3,6	dBm/38.16MHz	-51.59		$-79.17 + \Delta_{BG\_offset}$	
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 $N_{oc}$ to be fulfilled.						
NOTE 3: SS-SINR, SS-RSRP, and $I_o$ 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: $\Delta_{BG\_offset}$ 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 $\varphi_1 = 5$ Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\varphi_{1,1} = 5$ Hz, $\varphi_{1,2} = 10$ Hz, $\varphi_{1,3} = 15$ 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 Config 2,3,5,6	FDD					
		TDD					
TDD configuration	Config 1,4 Config 2,5 Config 3,6	Not Applicable					
		TDDConf.1.1					
		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 Config 2, 5 Config 3, 6	TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
		TRS.1.1 TDD	-	TRS.1.1 TDD	-	TRS.1.1 TDD	-
		TRS.1.2 TDD	-	TRS.1.2 TDD	-	TRS.1.2 TDD	-
PDSCH Reference measurement channel	Config 1,4 Config 2,5 Config 3,6	SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-
		SR.2.1 TDD	-	SR.2.1 TDD	-	SR.2.1 TDD	-
RMSI CORESET Reference Channel	Config 1,4 Config 2,5 Config 3,6	CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-
		CR.2.1 TDD	-	CR.2.1 TDD	-	CR.2.1 TDD	-
Dedicated CORESET Reference Channel	Config 1,4 Config 2,5 Config 3,6	CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
		CCR.1.1 TDD	-	CCR.1.1 TDD	-	CCR.1.1 TDD	-
		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 Config 1,4	μs	-	3	-	3	-
		ms	-	3	-	3	-
STMC configuration	Config 2,3,5,6 Config 1,4	SMTTC.1					
		SMTTC.2					
SSB configuration	Config 1,2,4,5 Config 3,6	SSB.1 FR1					
		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5 Config 3,6	kHz	15				
			30				
EPRE ratio of PSS to SSS		dB	0	0	0	0	0
EPRE ratio of PBCH DMRS to SSS			0	0	0	0	0
EPRE ratio of PBCH to PBCH DMRS			0	0	0	0	0
EPRE ratio of PDCCH DMRS to SSS			0	0	0	0	0

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
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)									
$N_{oc}$ <sup>Note2</sup>	Config 1,2,4,5	Depending on band group	dBm/15k Hz	-88	-88	-108.5	-108.5	-119.5+ $\Delta_{BG\_offset}$	-119.5+ $\Delta_{BG\_offset}$
$N_{oc}$ <sup>Note2</sup>	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+ $\Delta_{BG\_offset}$	116.5+ $\Delta_{BG\_offset}$
$\hat{E}_s / I_{ot}$			dB	-1.75	-1.75	20	20	-3.2	-3.2
$\hat{E}_s / N_{oc}$			dB	-1.75	-1.75	20	20	-3.2	-3.2
SS- RSRP <sup>Note3</sup>	Config 1,2,4,5	Depending on band group	dBm/SCS	-89.75	-89.75	-88.5	-88.5	-122.7+ $\Delta_{BG\_offset}$	-122.7+ $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group		-86.75	-86.75	-85.5	-85.5	-119.7+ $\Delta_{BG\_offset}$	-119.7+ $\Delta_{BG\_offset}$
SS-SINR <sup>Note3</sup>			dB	-1.75	-1.75	20	20	-3.2	-3.2
$I_o$ <sup>Note3</sup>	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-57.83	-57.83	-60.5	-60.5	-89.85+ $\Delta_{BG\_offset}$	-89.85+ $\Delta_{BG\_offset}$
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-51.73	-51.73	-54.41	-54.41	-83.75+ $\Delta_{BG\_offset}$	-83.75+ $\Delta_{BG\_offset}$
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 $N_{oc}$ to be fulfilled.									
NOTE 3: SS-SINR, SS-RSRP, and $I_o$ 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: $\Delta_{BG\_offset}$ 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 $\varphi_1 = 5$ Hz
	TE Part 4Rx	A.3.1.8.5 with $n = 2$ and $\varphi_{1,1} = 5$ Hz, $\varphi_{1,2} = 10$ Hz, $\varphi_{1,3} = 15$ 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  $O_n$  and Test Mode  $O_n$ , 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 4.7.3.2.2.5-1: 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 <sub>x</sub> - 10	SS-SINR <sub>x</sub> - 10	SS-SINR <sub>x</sub> - 11
Highest reported value (Cell 3)	SS-SINR <sub>x</sub> + 10	SS-SINR <sub>x</sub> + 10	SS-SINR <sub>x</sub> + 11
Extreme Conditions			
Lowest reported value (Cell 3)	SS-SINR <sub>x</sub> - 12	SS-SINR <sub>x</sub> - 12	SS-SINR <sub>x</sub> - 12
Highest reported value (Cell 3)	SS-SINR <sub>x</sub> + 12	SS-SINR <sub>x</sub> + 12	SS-SINR <sub>x</sub> + 12
RSRQ <sub>x</sub> 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 $\hat{E}_s/\text{lot}$	$I_o$ <sup>Note 1</sup> range				
			NR operating band groups <sup>Note 2</sup>	Minimum $I_o$		Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{SSB}$			dBm/ $BW_{\text{Channel}}$
			$SCS_{SSB} = 15 \text{ kHz}$	$SCS_{SSB} = 30 \text{ kHz}$			
$\pm 5.0$	$\pm 9.5$	$\geq -3$	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_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
$\pm 8.5$	$\pm 11.5$	$\geq -3$	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:  $I_o$  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 $\bar{E}_s/\text{lot}$ Note 2	$l_0$ Note 1 range				
			NR operating band groups Note 4	Minimum $l_0$		Maximum $l_0$	
dB	dB	dB		dBm / SCS <sub>SSB</sub>		dBm/BW <sub>channel</sub>	
				SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz		
±3	±4	≥-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_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:  $l_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\bar{E}_s/\text{lot}$  is the minimum SSB  $\bar{E}_s/\text{lot}$  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 Es/lot	Io <sup>Note 1</sup> range					
			NR operating band groups <sup>Note 2</sup>	Minimum Io			Maximum Io	
dB	dB	dB		dBm / SCS <sub>CSI-RS</sub>				dBm/BW <sub>channel</sub>
			SCS <sub>CSI-RS</sub> = 15 kHz	SCS <sub>CSI-RS</sub> = 30 kHz	SCS <sub>CSI-RS</sub> = 60 kHz			
±5.0	±9.5	≥-3	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
			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 $\hat{E}_s/\text{lot}$ Note 2	$I_0$ Note 1 range			Maximum $I_0$		
			NR operating band groups Note 4	Minimum $I_0$				
dB	dB	dB		dBm / $SCS_{\text{CSI-RS}}$			dBm/ $BW_{\text{Channel}}$	
				$SCS_{\text{CSI-RS}} = 15$ kHz	$SCS_{\text{CSI-RS}} = 30$ kHz	$SCS_{\text{CSI-RS}} = 60$ kHz		
$\pm 3$	$\pm 4$	$\geq 3$	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
			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:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter CSI-RS  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS  $\hat{E}_s/\text{lot}$  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 $n = 1$
	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 and SSB#1 in the periodic L1-RSRP reports. If the value for both SSBs 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	1 entry		
SEQUENCE			
(SIZE(1..maxNrofFailureDetectionResources)) OF			
SEQUENCE {			
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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,C</sub> = 52	10: N <sub>RB,C</sub> = 52
	2,5		10: N <sub>RB,C</sub> = 52	10: N <sub>RB,C</sub> = 52
	3,6		40: N <sub>RB,C</sub> = 106	40: N <sub>RB,C</sub> = 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

Parameter	Config	Unit	Test 1	Test 2
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 SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>				
$N_{oc}$ <sup>Note 2</sup>				
Depending on band group	3,6	-96.00	$117 + \Delta_{BG\_offset}$	
	$N_{oc}$ <sup>Note 2</sup>	1,2,4,5	dBm/SSB SCS	-94.65
3,6	-93.00	$-114 + \Delta_{BG\_offset}$		
$\hat{E}_s / I_{ot}$	1~6	dB	10	-2.2
SSB RSRP <sup>Note 3</sup>	1,2,4,5	dBm/SSB SCS	-84.65	$-119.2 + \Delta_{BG\_offset}$
	3,6		-83.00	$-116.2 + \Delta_{BG\_offset}$
$I_o$ <sup>Note 3</sup>	1,2,4,5	dBm/9.36 MHz	-56.28	$-87.00 + \Delta_{BG\_offset}$
	3,6		dBm/38.16 MHz	-51.53
$\hat{E}_s / N_{oc}$	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 $N_{oc}$ to be fulfilled.				
NOTE 3: RSRP and $I_o$ 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
<b>Extreme Conditions</b>	<b>Test 1 All bands</b>	<b>Test 2</b>	
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 $n = 1$
	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 L1-RSRP value for SSB#1 is compared to the L1-RSRP value for SSB#0. If the difference 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 reported value (Cell 2 SSB resource 1)	RSRP <sub>x</sub> - 3	RSRP <sub>x</sub> - 3
Highest reported value (Cell 2 SSB resource 1)	RSRP <sub>x</sub> + 3	RSRP <sub>x</sub> + 3
Extreme Conditions		
Lowest reported value (Cell 2 SSB resource 1)	RSRP <sub>x</sub> - 4	RSRP <sub>x</sub> - 4
Highest reported value (Cell 2 SSB resource 1)	RSRP <sub>x</sub> + 4	RSRP <sub>x</sub> + 4
RSRP <sub>x</sub> is the reported value of Cell 2 SSB resource 0		

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 $n = 1$
	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 and CSI-RS #1 in the periodic L1-RSRP reports. If the value for both CSI-RSs 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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
	1,4		SR.1.1 FDD	SR.1.1 FDD

Parameter	Config	Unit	Test 1	Test 2
PDSCH Reference 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 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		SMTTC.1	SMTTC.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 SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>				
$N_{oc}$ Note2	Depending on band group	1,2,4,5	-94.65	-117+ $\Delta_{BG\_offset}$
		3,6	-96.00	117+ $\Delta_{BG\_offset}$
$N_{oc}$ Note2	Depending on band group	1,2,4,5	-94.65	-117+ $\Delta_{BG\_offset}$
		3,6	-93.00	-114+ $\Delta_{BG\_offset}$
$\hat{E}_s/I_{ot}$	1~6	dB	10	-2.2
CSI-RSRP Note3	Depending on band group	1,2,4,5	-84.65	-119.2 + $\Delta_{BG\_offset}$
		3,6	-83.00	-116.2 + $\Delta_{BG\_offset}$
$I_o$ Note3	Depending on band group	1,2,4,5	-56.28	-87.00 + $\Delta_{BG\_offset}$
		3,6	-51.53	-80.90 + $\Delta_{BG\_offset}$
$\hat{E}_s/N_{oc}$	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.

Parameter	Config	Unit	Test 1	Test 2
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 $N_{oc}$ to be fulfilled.				
NOTE 3: RSRP and $I_o$ 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 $n = 1$
	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 L1-RSRP value for CSI-RS #1 is compared to the L1-RSRP value for CSI-RS #0. If the difference 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.
- $I_o$  range defined in Table 4.7.5.0.1-1.

**Table 4.7.5.0.1-1: PCell  $I_o$  range conditions for SFTD measurement accuracy**

Parameter	$I_o$ <sup>Note 1</sup> range		
	E-UTRA operating band groups <sup>Note 4, 5</sup>	Minimum $I_o$ dBm/15kHz <sup>Note 2, 3</sup>	Maximum $I_o$ dBm/BW <sub>Channel</sub>
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  $I_o$  condition is expressed as the average  $I_o$  per RE over all REs in that symbol.  $I_o$  may be different in different symbols within a subframe.

NOTE 2: The condition level is increased by  $\Delta > 0$ , 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.
- $I_o$  range defined in Table 4.7.5.0.1-2.

Table 4.7.5.0.1-2: NR PSCell, or NR cell  $I_o$  range conditions for SFTD measurement accuracy in FR1

Parameter	$I_o$ <sup>Note 1</sup> range			
	NR operating band groups <sup>Note 4, 5</sup>	Minimum $I_o$ <sup>Note 2, 3</sup>		Maximum $I_o$
		dBm/SCS <sub>SSB</sub>		
		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>channel</sub>
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:  $I_o$  is assumed to have constant EPRE across the bandwidth.NOTE 2: The condition level is increased by  $\Delta R_{B,C}$  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	
	$\hat{E}s/lot$	Frequency range
$T_s$ <sup>Note 1</sup>	dB	
40	$\geq -3$ dB	FR1
40		FR2

NOTE 1:  $T_s$  is the basic timing unit defined in TS 36.211 [24].  
NOTE 2: The parameter  $\hat{E}s/lot$  is the minimum  $\hat{E}s/lot$  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 $n = 1$
	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 *sfm-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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 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

Parameter	Config	Unit	Test 1
	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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS			
Note 1			
$N_{oc}$ <sup>Note2</sup>	1~6	dBm/15kHz	-104
$N_{oc}$ <sup>Note2</sup>	1,2,4,5	dBm/SSB SCS	-104
	3,6		-101
$\hat{E}_s/I_{ot}$	1~6	dB	-2.7
$\hat{E}_s/N_{oc}$	1~6	dB	-2.7
SS-RSRP <sup>Note3</sup>	1,2,4,5	dBm/SCS	-106.7
	3,6		-103.7
I <sub>o</sub> <sup>Note3</sup>	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 $N_{oc}$ to be fulfilled.			
NOTE 3: SS-RSRP and I <sub>o</sub> 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 and Table 4.7.6.0.1-2 for FR2, 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 [18] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z 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  $T_{\text{error\_SRS\_RSRP}}$ , where
  - $T_{\text{error\_SRS\_RSRP}} = T_C \times N_{\text{TA\_offset}} + 4.67\mu\text{s}$  for FR1
  - $T_{\text{error\_SRS\_RSRP}} = T_C \times N_{\text{TA\_offset}} + 3.67\mu\text{s}$  for FR2
  - $N_{\text{TA\_offset}}$  is defined in Table 7.1.2-2
  - $T_C$  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  $\text{transmissionComb} = n_4$ , and no less than 4 if  $\text{transmissionComb} = n_2$ .

Table 4.7.6.0.1-1: SRS-RSRP absolute accuracy in FR1

Accuracy						Conditions						
Normal condition			Extreme condition			SRS Es/lot	Io <sup>Note 1</sup> range					
dB			dB				NR operating band groups <sup>Note 2</sup>	Minimum Io			Maximum Io	
SCS <sub>SRS</sub> (kHz)			SCS <sub>SRS</sub> (kHz)			dBm / SCS <sub>SRS</sub>		dBm/BW Channel	dBm/BW Channel			
15	30	60	15	30	60		SCS <sub>SRS</sub> s = 15 kHz			SCS <sub>SRS</sub> s = 30 kHz	SCS <sub>SRS</sub> s = 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	N/A	N/A	N/A	-70	-50
							NR_TDD_FR1_C					
							NR_TDD_FR1_D					
							NR_TDD_FR1_E					

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 4.7.6.0.1-2: SRS-RSRP absolute accuracy in FR2

Accuracy				Conditions				
Normal condition		Extreme condition		SRS Es/lot	Io <sup>Note 1</sup> range			
dB		dB			Minimum Io		Maximum Io	
SCS <sub>SRS</sub> (kHz)		SCS <sub>SRS</sub> (kHz)		dBm / SCS <sub>SRS</sub> <sup>Note 2</sup>	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
60	120	60	120				SCS <sub>SRS</sub> = 60kHz	SCS <sub>SRS</sub> = 120kHz
±6	±8.5	±9	±11.5	≥1	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival	N/A	-70	
±9	±11.5	±11	±13.5	≥1	N/A	-70	-50	

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

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 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 3: In the test cases, the SSB Es/lot and related parameters may need to be adjusted to ensure Es/lot at UE baseband is above the value defined in this table.

## 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.

#### 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 and Table 4.7.6.0.2-2 for FR2, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] 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 <sup>Note 1</sup> range					
		NR operating band groups <sup>Note 2</sup>	Minimum Io			Maximum Io	
dB	dB		dBm / SCS <sub>SRS</sub>			dBm/BW <sub>channel</sub>	dBm/BW <sub>channel</sub>
		SCS <sub>SRS</sub> = 15 kHz	SCS <sub>SRS</sub> = 30 kHz	SCS <sub>SRS</sub> = 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 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.

Table 4.7.6.0.2-2: CLI-RSSI absolute accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	I <sub>o</sub> <sup>Note 1</sup> range		
dB	dB	Minimum I <sub>o</sub>		Maximum I <sub>o</sub>
		dBm / SCS <sub>SRS</sub> <sup>Note 2</sup>	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
		SCS <sub>SRS</sub> = 60kHz		
±5	±8	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival		N/A
±7	±10	Note 4		-70
				-50

NOTE 1: I<sub>o</sub> specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
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 [19]. Applicable side condition selected depending on angle of arrival.  
NOTE 3: In the test cases, the SSB E<sub>s</sub>/lot and related parameters may need to be adjusted to ensure E<sub>s</sub>/lot at UE baseband is above the value defined in this table.  
NOTE 4: The same bands and the same I<sub>o</sub> conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

## 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.

## 4.7.6.1 EN-DC SRS-RSRP 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

## 4.7.6.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

## 4.7.6.1.2 Test applicability

FFS

#### 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

##### 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. Test environment parameters are given in Table 4.7.6.2.4.1-2.

**Table 4.7.6.1.4.1-1: EN-DC FR1 SRS-RSRP accuracy supported test configurations**

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 4.7.6.1.4.1-2: SRS Configuration parameters for EN-DC SRS-RSRP 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, 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
	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 4.7.6.1.4.3.
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 SRS-RSRP measurements. 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.

#### 4.7.6.1.4.2 Test procedure

FFS

#### 4.7.6.1.4.3 Message contents

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

FFS

#### 4.7.6.1.5 Test requirement

Table 4.7.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.7.6.1.5-1: NR Cell specific test parameters for EN-DC SRS-RSRP accuracy for PSCell

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		
BW <sub>channel</sub>	1,3	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52		
	2,4		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106		
PDSCH Reference measurement channel	1,3		SR.1.1 TDD	SR.1.1 TDD	SR.1.1 TDD		
	2,4		SR.2.1 TDD	SR.2.1 TDD	SR.2.1 TDD		
RMSI CORESET Reference Channel	1,3		CR.1.1 TDD	CR.1.1 TDD	CR.1.1 TDD		
	2,4		CR.2.1 TDD	CR.2.1 TDD	CR.2.1 TDD		
Dedicated CORESET Reference Channel	1,3		CCR.1.1 TDD	CCR.1.1 TDD	CCR.1.1 TDD		
	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		
SMTTC configuration	1~4		SMTTC.1	SMTTC.1	SMTTC.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 SSS <sup>Note 1</sup>							
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>							
$N_{oc}$ Note2						NR_TDD_FR1_A <sup>Note3</sup>	dBm/15kHz
	NR_TDD_FR1_C	-113					
	NR_TDD_FR1_D	-112.5					
	NR_TDD_FR1_E	2,4	Not applicable <sup>Note4</sup>	-91	-112		
					NR_TDD_FR1_A <sup>Note3</sup>	-114	
					NR_TDD_FR1_C	-113	
					NR_TDD_FR1_D	-112.5	
$N_{oc}$ Note2	NR_TDD_FR1_A <sup>Note3</sup>	dBm/SRS SCS	-106	-88	-114		
					NR_TDD_FR1_C	-113	
					NR_TDD_FR1_D	-112.5	
	NR_TDD_FR1_E		2,4	Not applicable <sup>Note4</sup>	-88	-112	
						NR_TDD_FR1_A <sup>Note3</sup>	-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 $N_{oc}$ 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: NR Cell specific test parameters for EN-DC FR1 SRS-RSRP accuracy for neighbour cell UE**

	Parameter	Config	Unit	Test 1	Test 2	Test 3
$N_{oc}$ Note2	NR_TDD_FR1_A NOTE 3	1,3	dBm/15kHz	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E	2,4	Not applicable <sup>Note 6</sup>	-91	-112	
	NR_TDD_FR1_A NOTE 5				-114	
	NR_TDD_FR1_C				-113	
	NR_TDD_FR1_D				-112.5	
NR_TDD_FR1_E	-112					
$N_{oc}$ 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	2,4	Not applicable <sup>Note 6</sup>	-88	-112	
	NR_TDD_FR1_A NOTE 5				-111	
	NR_TDD_FR1_C				-110	
	NR_TDD_FR1_D				-109.5	
NR_TDD_FR1_E	-109					
$\hat{E}_s / I_{ot}$ on SRS		1~4	dB	1	1	1
SRS RSRP Note3	NR_TDD_FR1_A NOTE 5	1,3	dBm/SRS SCS	-105 +TT	-87 +TT	-113+TT
	NR_TDD_FR1_C					-112+TT
	NR_TDD_FR1_D					-111.5+TT
	NR_TDD_FR1_E	2,4	Not applicable <sup>Note 6</sup>	-87+TT	-111+TT	
	NR_TDD_FR1_A NOTE 5				-110+TT	
	NR_TDD_FR1_C				-109+TT	
	NR_TDD_FR1_D				-108.5+TT	
NR_TDD_FR1_E	-108+TT					
$I_o$ Note3	NR_TDD_FR1_A NOTE 5	1,3	dBm/9.36 MHz	-74.51	-56.51	-82.51
	NR_TDD_FR1_C					-81.51
	NR_TDD_FR1_D					-81.01
	NR_TDD_FR1_E	2,4	dBm/38.16 MHz	Not applicable <sup>Note 6</sup>	-53.42	-79.51
	NR_TDD_FR1_A NOTE 5					-76.42
	NR_TDD_FR1_C					-75.42
	NR_TDD_FR1_D					-74.92
NR_TDD_FR1_E	-74.42					
$\hat{E}_s / N_{oc}$ on SRS		1~4	dB	1	1	1
Propagation condition		1~4		AWGN	AWGN	AWGN
Antenna configuration		1~4		1x2	1x2	1x2
SRS configuration		1,3		SRSCConf.1	SRSCConf.1	SRSCConf.1
		2,4		SRSCConf.2	SRSCConf.2	SRSCConf.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 $N_{oc}$ to be fulfilled.
Note 3:	RSRP and $I_o$ 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

Table 4.7.6.1.5-3: SRS configuration for FR1 SRS-RSRP accuracy

	Field	SRSCConf.1	SRSCConf.2
SRS-ResourceSet	srs-ResourceSetId	0	0
	srs-ResourceSetList	0	0
	resourceType	Periodic	Periodic
	Usage	Codebook	Codebook
SRS-Resource	SRS-ResourceSetId	0	0
	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

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
BW <sub>channel</sub>	1,3	MHz	10: N <sub>RB,c</sub> = 52
	2,4		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement channel	1,3		SR.1.1 TDD
	2,4		SR.2.1 TDD
RMSI CORESET Reference Channel	1,3		CR.1.1 TDD
	2,4		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,3		CCR.1.1 TDD
	2,4		CCR.2.1 TDD
SSB configuration	1,3		SSB.1 FR1
	2,4		SSB.2 FR1
OCNG Patterns <sup>Note6</sup>	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 SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>			
N <sub>oc</sub> on CLI-RSSI measurement resource <sup>Note2</sup>	1,3	dBm/15kHz	-106
	2,4		-106
N <sub>oc</sub> on CLI-RSSI measurement resource <sup>Note2</sup>	1,3	dBm/ BWP SCS	-106
	2,4		-103
$\hat{E}_s/I_{ot}$ on CLI-RSSI measurement resource	1~4	dB	-Infinity
RSRP on CLI-RSSI measurement resource <sup>Note3</sup>	1~4	dBm/ BWP SCS	-Infinity
I <sub>o</sub> on CLI-RSSI measurement resource <sup>Note3</sup>	1,3	dBm/9.36 MHz	-78.05+TT
	2,4	dBm/38.16 MHz	-71.96+TT
I <sub>o</sub> on CLI-RSSI measurement resource <sup>Note3</sup>	1,3	dBm/1.08 MHz	-87.43+TT
	2,4		-87.44+TT

$\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource	1~4	dB	-Infinity
Propagation condition	1~4		AWGN
Antenna configuration	1~4		1x2
<p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>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 <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>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</p> <p>Note 6: OCNG is not transmitted in the CLI-RSSI measurement resources.</p>			

Table 4.7.6.2.5-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy

	Field	Config	SRSCConf.1
CLI-RSSI measurement resource	rssi-ResourceId	1~4	0
	rssi-SCS	1,3	15kHz
		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  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ .

The value of  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$  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,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  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,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  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,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , 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.

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.
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < \text{MGRP}$ )
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- $P=3$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}} - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} < 0.5 * T_{\text{SMTCperiod}}$

- $P = \frac{3}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} = 0.5 * T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\min(T_{\text{SMTCperiod}}, \text{MGRP})}}$ , when CSI-RS is partially overlapped with measurement gap ( $T_{\text{CSI-RS}} < \text{MGRP}$ ) and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P = \frac{3}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )

Where:

$T_{\text{SMTCperiod}}$  = the configured SMTC1 period or SMTC2 period if configured.

$T_{\text{CSI-RS}}$  = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured,  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  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 previous conditions.

**Table 4.7.7.0.1-1: Measurement period  $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}}$  for FR1**

Configuration	$T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}}$ (ms)
non-DRX	$\max(T_{\text{Report}}, \text{ceil}(M * P) * T_{\text{CSI-RS}})$
DRX cycle $\leq$ 320ms	$\max(T_{\text{Report}}, \text{ceil}(1.5 * M * P) * \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $>$ 320ms	$\text{ceil}(M * P) * T_{\text{DRX}}$
Note 1:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ 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  $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}}$  for FR2**

Configuration	$T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}}$ (ms)
non-DRX	$\max(T_{\text{Report}}, \text{ceil}(M * P * N) * T_{\text{CSI-RS}})$
DRX cycle $\leq$ 320ms	$\max(T_{\text{Report}}, \text{ceil}(1.5 * M * P * N) * \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $>$ 320ms	$\text{ceil}(M * P * N) * T_{\text{DRX}}$
Note 1:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ 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 $\hat{E}_s/\text{lot}$	$I_o$ <sup>Note 1</sup> range					
			NR operating band groups <sup>Note 2</sup>	Minimum $I_o$			Maximum $I_o$	
dB	dB	dB		dBm / $SCS_{\text{CSI-RS}}$			dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
			$SCS_{\text{CSI-RS}} = 15$ kHz	$SCS_{\text{CSI-RS}} = 30$ kHz	$SCS_{\text{CSI-RS}} = 60$ kHz			
$\pm 5.5$	$\pm 6.5$	$\geq -3$	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
			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:  $I_o$  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  $T_{\text{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}}$ .

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  $T_{\text{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}}$  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  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$ , i.e.,  $P = \max(P_{\text{CMR}}, P_{\text{IMR}})$ , where

- the value of  $P_{\text{CMR}}$  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  $P_{IMR}$  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 previous 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  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  for FR1**

Configuration	$T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{SSB})$
DRX cycle $\leq$ 320ms	$\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{SSB}))$
DRX cycle $>$ 320ms	$\text{ceil}(M \cdot P) \cdot T_{DRX}$
Note 1:	$T_{SSB} = \text{ssb-periodicityServingCell}$ is the periodicity of the SSB-Index configured for L1-SINR channel measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ 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  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  for FR2**

Configuration	$T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M \cdot P \cdot N) \cdot T_{SSB})$
DRX cycle $\leq$ 320ms	$\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{DRX}, T_{SSB}))$
DRX cycle $>$ 320ms	$\text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot T_{DRX}$
Note 1:	$T_{SSB} = \text{ssb-periodicityServingCell}$ is the periodicity of the SSB-Index configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ 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 Es/lot	NZP-IMR Es/lot	Io <sup>Note 1</sup> range				
				NR operating band groups <sup>Note 2</sup>	Minimum Io		Maximum Io	
dB	dB	dB	dB		dBm / SCS <sub>SSB</sub>			dBm/BW <sub>Channel</sub>
				SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>		
±4.0	±5.0	≥0	≥0	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121		-118	N/A
				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_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 Es/lot	Io <sup>Note 1</sup> range				
			NR operating band groups <sup>Note 2</sup>	Minimum Io		Maximum Io	
dB	dB	dB		dB	dBm / SCS <sub>SSB</sub>		dBm/BW <sub>Channel</sub>
			SCS <sub>SSB</sub> = 15 kHz		SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	
±4.5	±5.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118		N/A
			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_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  $T_{L1}$ .

$SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR$ .

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  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$  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,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  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,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  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  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$ , i.e.,  $P = \max(P_{\text{CMR}}, P_{\text{IMR}})$ , where

- The value of  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$  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 previous 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  $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}}$  for FR1**

Configuration	$T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}}$ (ms)
non-DRX	$\max(T_{\text{Report}}, \text{ceil}(M \cdot P) \cdot T_{\text{CSI-RS}})$
DRX cycle $\leq 320\text{ms}$	$\max(T_{\text{Report}}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $> 320\text{ms}$	$\text{ceil}(M \cdot P) \cdot T_{\text{DRX}}$
Note 1:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ 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  $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}}$  for FR2**

Configuration	$T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}}$ (ms)
non-DRX	$\max(T_{\text{Report}}, \text{ceil}(M \cdot P \cdot N) \cdot T_{\text{CSI-RS}})$
DRX cycle $\leq 320\text{ms}$	$\max(T_{\text{Report}}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$
DRX cycle $> 320\text{ms}$	$\text{ceil}(M \cdot P \cdot N) \cdot T_{\text{DRX}}$
Note 1:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ 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 $\hat{E}_s/\text{lot}$	NZP-IMR $\hat{E}_s/\text{lot}$	$I_o$ <sup>Note 1</sup> range			dBm/BW <sub>channel</sub>	dBm/BW <sub>channel</sub>	
				NR operating band groups <sup>Note 2</sup>	Minimum $I_o$				
dB	dB	dB	dB		dBm / SCS <sub>CSI-RS</sub>				
					SCS <sub>CSI-RS</sub> = 15 kHz	SCS <sub>CSI-RS</sub> = 30 kHz	SCS <sub>CSI-RS</sub> = 60 kHz		
±4.0	±5.0	≥0	≥0	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
				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:  $I_o$  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 $\hat{E}_s/\text{lot}$	$I_o$ <sup>Note 1</sup> range			dBm/BW <sub>channel</sub>	dBm/BW <sub>channel</sub>	
			NR operating band groups <sup>Note 2</sup>	Minimum $I_o$				
dB	dB	dB		dBm / SCS <sub>CSI-RS</sub>				
				SCS <sub>CSI-RS</sub> = 15 kHz	SCS <sub>CSI-RS</sub> = 30 kHz	SCS <sub>CSI-RS</sub> = 60 kHz		
±4.5	±5.5	≥3	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
			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:  $I_o$  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 { purpose	1 entry		
	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
	1,4		FDD	FDD
Duplex mode	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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 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 SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>				
$N_{oc}$ <sup>Note2</sup>				
	3,6	-96.00	-117+ $\Delta_{BG\_offset}$	
$N_{oc}$ <sup>Note2</sup>	Depending on band group	1,2,4,5	-94.65	-117+ $\Delta_{BG\_offset}$
		3,6	-93.00	-114+ $\Delta_{BG\_offset}$
$\hat{E}_s/I_{ot}$	1-6	dB	10	-2.2
SSB RSRP <sup>Note3</sup>	Depending on band group	1,2,4,5	-84.65	-119.2 + $\Delta_{BG\_offset}$
		3,6	-83.00	-116.2 + $\Delta_{BG\_offset}$
$I_o$ <sup>Note3</sup>	Depending on band group	1,2,4,5	-56.28	-87.00 + $\Delta_{BG\_offset}$
		3,6	-51.53	-80.90 + $\Delta_{BG\_offset}$
$\hat{E}_s/N_{oc}$	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  $N_{oc}$  to be fulfilled.
- Note 3: RSRP and  $I_0$  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
<b>Extreme Conditions</b>	<b>Test 1 All bands</b>	<b>Test 2</b>	
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 $n = 1$
	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 <sub>x</sub> - 9	L1-SINR <sub>x</sub> - 9
Highest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> + 9	L1-SINR <sub>x</sub> + 9
Extreme Conditions		
Lowest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> - 10	L1-SINR <sub>x</sub> - 10
Highest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> + 10	L1-SINR <sub>x</sub> + 10
L1-SINR <sub>x</sub> 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 $n = 1$
	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
	1,4		FDD	FDD
	2,5		TDD	TDD
Duplex mode	3,6		TDD	TDD
	1,4		N/A	N/A
	2,5		TDDConf.1.1	TDDConf.1.1
TDD Configuration	3,6		TDDConf.2.1	TDDConf.2.1

BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52	
	2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52	
	3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 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 SSS <sup>Note 1</sup>					
$N_{oc}$ <sup>Note2</sup>	Depending on band group	1,2,4,5	dBm/15kHz	-94.65	-117+ $\Delta_{BG\_offset}$
		3,6		-96.00	-117+ $\Delta_{BG\_offset}$
$N_{oc}$ <sup>Note2</sup>	Depending on band group	1,2,4,5	dBm/SSB SCS	-94.65	-117+ $\Delta_{BG\_offset}$
		3,6		-93.00	-114+ $\Delta_{BG\_offset}$
$\hat{E}_s/I_{ot}$	1-6	dB	10	-2.2	
SSB RSRP <sup>Note3</sup>	Depending on band group	1,2,4,5	dBm/SSB SCS	-84.65	-119.2 + $\Delta_{BG\_offset}$
		3,6		-83.00	-116.2 + $\Delta_{BG\_offset}$
$I_0$ <sup>Note3</sup>	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	-87.00 + $\Delta_{BG\_offset}$
		3,6		dBm/38.16 MHz	-51.53
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>					

$\hat{E}_s/N_{oc}$	1~6	dB	10	-2.2
Propagation condition	1~6		AWGN	AWGN
antenna configuration	1~6		1x2	1x2
<p>Note 1: OCSG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>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 <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>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.</p>				

**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  $O_n$  and Test Mode  $O_n$ , 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	1 entry		
SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {			
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
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 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 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 SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>				
$\hat{E}_s/I_{ot}$				
	1,2,4,5	dBm/15kHz	-94.65	-117+ $\Delta$ BG_offset

$N_{oc}$ <small>Note2</small>	Depending on band group	3,6		-96.00	$-117 + \Delta_{BG\_offset}$
$N_{oc}$ <small>Note2</small>		1,2,4,5	dBm/SSB SCS	-94.65	$-117 + \Delta_{BG\_offset}$
		3,6		-93.00	$-114 + \Delta_{BG\_offset}$
$\hat{E}_s / I_{ot}$		1-6	dB	10	0.8
SSB RSRP <small>Note3</small>	Depending on band group	1,2,4,5	dBm/SSB SCS	-84.65	$-119.2 + \Delta_{BG\_offset}$
		3,6		-83.00	$-116.2 + \Delta_{BG\_offset}$
$I_o$ <small>Note3</small>	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	$-87.00 + \Delta_{BG\_offset}$
		3,6	dBm/38.16 MHz	-51.53	$-80.90 + \Delta_{BG\_offset}$
$\hat{E}_s / N_{oc}$		1-6	dB	10	0.8
Propagation condition		1-6		AWGN	AWGN
Antenna configuration		1-6		1x2	1x2
<p>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.</p> <p>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 <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>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</p>					

**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**

	<b>Test 1</b>	<b>Test 2</b>
	All bands	All bands
<b>Normal Conditions</b>		
Lowest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> - 9	L1-SINR <sub>x</sub> - 9
Highest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> + 9	L1-SINR <sub>x</sub> + 9
<b>Extreme Conditions</b>		
Lowest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> - 10	L1-SINR <sub>x</sub> - 10
Highest reported value (CSI-RS#1)	L1-SINR <sub>x</sub> + 10	L1-SINR <sub>x</sub> + 10
L1-SINR <sub>x</sub> 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  $n + T_{\text{config\_EUTRAN-PSCell}}$ :

Where:

$$T_{\text{config\_EUTRAN-PSCell}} = T_{\text{RRC\_delay}} + T_{\text{activation\_time}} + 50\text{ms} + T_{\text{E-UTRAN-PSCell\_DU}}$$

$T_{\text{RRC\_delay}}$  is the RRC procedure delay as specified in TS 38.331 [13].



$T_{\text{activation\_time}}$  is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then  $T_{\text{activation\_time}}$  is 20ms. If the E-UTRAN PSCell is unknown, then  $T_{\text{activation\_time}}$  is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

$T_{\text{E-UTRAN-PSCell\_DU}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell.  $T_{\text{E-UTRAN-PSCell\_DU}}$  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  $T_{\text{config\_EUTRAN-PSCell}}$  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 SCCells and/or E-UTRAN SCCells.

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  $n + T_{\text{RRC\_delay}}$ .

Where

$T_{\text{RRC\_delay}}$  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**

- **TT analysis and test requirements are missing**
- **Test procedure is FFS**
- **Message contents are not added**

#### 4A.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.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards.

#### 4A.1.1.3 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.1.1.4 Test description

## 4A.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.1.1.4.1-1.

**Table 4A.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.1.1.4.1-2.

**Table 4A.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	FFS	
Propagation conditions	AWGN	FFS
Connection Diagram	TE Part 2Rx	FFS
	TE Part 4Rx	FFS
	DUT Part 2Rx	FFS
	DUT Part 4Rx	FFS
Exceptions to connection diagram	N/A	

## 4A.1.1.4.2 Test Procedure

FFS

## 4A.1.1.4.3 Message Contents

FFS

## 4A.1.1.5 Test Requirements

FFS

## 4A.1.2 Active BWP switch delay

FFS

## 4A.2 Measurement performance requirements

## 4A.2.1 SFTD accuracy

FFS