# 7 NR standalone with at least one NR cell in FR2

## 7.0 General

This section contains test scenarios for NR standalone. This configuration is also known as NR/5GC. At least one NR cell is in Frequency Range 2.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

## 7.1 RRC\_IDLE state mobility

### 7.1.1 NR cell re-selection

#### 7.1.1.0 Minimum conformance requirements

##### 7.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than Tevaluate NR\_Intra + TSI-NR in RRC\_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within Tdetect,NR\_Intraas defined in table 4.2.2.3-1 of TS 38.133 [6] when that Treselection= 0*.* An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every Tmeasure,NR\_Intra (see table 4.2.2.3-1 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,NR\_Intra/2.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within Tevaluate,NR\_Intra when Treselection = 0as specified in table 4.2.2.3-1 of TS 38.133 [6] provided that the cell has at least [3]dB better ranked.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If Treselection timer has a non-zero value and non-zeroa-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [30], the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

##### 7.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection

The cell re-selection delay shall be less than Tevaluate NR\_Intra + TSI-NR in RRC\_IDLE state.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 of TS 38.133 [6].

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this subclause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [30] within Kcarrier \* Tdetect,NR\_Inter if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least [5] dB for reselections based on ranking or [6]dB for SS-RSRP reselections based on absolute priorities or [4]dB for SS-RSRQ reselections based on absolute priorities. The parameter Kcarrier is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 of TS 38.133 [6] for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,NR\_Inter. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every Kcarrier \* Tmeasure,NR\_Inter (see table 4.2.2.4-1 of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,NR\_Inter/2.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within Kcarrier \* Tevaluate,NR\_Inter when Treselection = 0as specified in table 4.2.2.4-1 of TS 38.133 [6] provided that the reselection criteria is met by

- the condition when performing equal priority reselection and the cell has at least [5]dB better ranked

- [6]dB for SS-RSRP reselections based on absolute priorities or

- [4]dB for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If Treselection timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 of TS 38.133 [6] under the following conditions:

- TSMTC\_intra = TSMTC\_inter = 160 ms; where TSMTC\_intra and TSMTC\_inter are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively,

- SMTC occasions configured for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the paging occasion [1].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

##### 7.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than Tevaluate NR\_Intra + TSI-NR in RRC\_IDLE state.

7.1.1.0.3.1 Introduction

This clause contains the requirements for measurements on intra-frequency NR cells when Srxlev ≤ SIntraSearchP or Squal ≤ SIntraSearchQ and when the UE is configured any of the following relaxed measurement critera:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],

- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30],

- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

7.1.1.0.3.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- Tdetect,NR\_Intraas specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

- Tmeasure,NR\_Intra as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

- Tevaluate,NR\_Intra as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

7.1.1.0.3.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criteria and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- Tdetect,NR\_Intraas specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

- Tmeasure,NR\_Intra as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

- Tevaluate,NR\_Intra as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

7.1.1.0.3.4 Measurements for UE fulfilling low mobility and not-at-cell edge criteria

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and

- has also fulfilled both criteria, and

- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra as defined in Table 4.2.2.3-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.9.

##### 7.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than Tevaluate NR\_Inter + TSI-NR in RRC\_IDLE state.

7.1.1.0.4.1 Introduction

This clause contains the requirements for measurements on inter-frequency NR cells when the UE is configured with any of following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],

- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4. 9.2 in TS 38.304 [30],

- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4. 9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

7.1.1.0.4.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- Tdetect,NR\_Interas specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

- Tmeasure,NR\_Inter as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

- Tevaluate,NR\_Inter as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and the UE is configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 of TS 38.133[6].

7.1.1.0.4.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with *cellEdgeEvaluation* [13] criterion, and UE has fulfilled or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then te requirements defined in clause 4.2.2.4 apply for this clause except that:

- Tdetect,NR\_Interas specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

- Tmeasure,NR\_Inter as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

- Tevaluate,NR\_Inter as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7

7.1.1.0.4.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and

- Has also fulfilled both criteria, and

- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter as defined in Table 4.2.2.4-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.10.

#### 7.1.1.1 NR SA FR2 cell re-selection

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.3.

7.1.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.1.

7.1.1.1.4 Test description

7.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.1.4.1-1.

Table 7.1.1.1.4.1-1: Supported test configurations for NR SA FR2 cell re-selection

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.1.1.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.1-2 | 240 kHz SSB SCS, 100 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 7.1.1.1.4.1-2.

Table 7.1.1.1.4.1-2: Initial conditions for NR SA FR2 cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.1.1.1.4.1-3.

2. Message contents are defined in clause 7.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.1.4.1-3: General test parameters for NR SA FR2 cell re-selection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell1 |  |
| T2 end condition | Active cell |  | 1, 2 | Cell2 |  |
| Neighbour cells |  | 1, 2 | Cell1 |  |
| Final | Active cell |  | 1, 2 | Cell1 |  |
| condition | Neighbour cell |  | 1, 2 | Cell2 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | |  | 1, 2 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1, 2 | 135 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2 | 35 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

7.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 7.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.1.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 130 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a.  
Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.1.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 27 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a.  
Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a.The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

12. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.  
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” 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 clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

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 7.1.1.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions |  |

Table 7.1.1.1.4.3-1A: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -60 | Actual value is -60\*2 = -120dBm | 7.1.1.1-1 |
|  | | -58 | Actual value is -58\*2 = -116dBm | 7.1.1.1-2 |
| } | |  |  |  |
| } | |  |  |  |

Table 7.1.1.1.4.3-1B: SIB2 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| q-RxLevMin | -60 | Actual value is -60\*2 = -120dBm | 7.1.1.1-1 |
|  | -58 | Actual value is -58\*2 = -116dBm | 7.1.1.1-2 |
| s-IntraSearchP | 25 | Actual value is 25\*2 = 50dB |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.1.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 190 |  |  |
| } |  |  |  |

7.1.1.1.5 Test requirement

Tables 7.1.1.1.4.1-3 and 7.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 7.1.1.1.5-1: Cell specific test parameters for NR SA FR2 cell re-selection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test config. | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration |  | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
| 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern |  | 1, 2 | OP.4 | | | OP.4 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1, 2 | 66 | | | 66 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -120Note 6 | | | -120 Note 6 | | |
| 2 | -117 Note 6 | | | -117 Note 6 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A. 9.1 | | | Setup 1 defined in A. 9.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | | | |
| Note 5 | dB | 1 | 7.56 | -3.34 | 1.61 | -infinity | 1.61 | -3.34 |
| 2 |
| Note2 | dBm/SCS | 1 | -93 | | | | | |
| 2 | -90 | | | | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | | | |
| 2 |
|  | dB | 1 | 8 | -2.9Note 6 | 2.05 Note 6 | -infinity | 2.05 Note 6 | -2.9Note 6 |
| 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85 | -95.9 | -90.9 | -infinity | -90.9 | -95.9 |
| 2 | -82 | -92.9 | -87.9 | -infinity | -87.9 | -92.9 |
| Io | dBm/95.04 MHz | 1 | -60.53 | -67.37 | -65.01 | -69.17 | -65.01 | -67.37 |
| 2 | -57.52 | -64.39 | -62.33 | -66.16 | -62.33 | -64.39 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including the test tolerance given in Annex F. | | | | | | | | |

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = Tdetect,NR\_Intra + TSI-NR

Tdetect,NR\_Intra = 128 s; as specified in TS 38.133 [6] clause 4.2.2.3.

TSI-NR = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 129.28 seconds in this test case (note: this gives a total of 129.28 seconds but the test allows 130 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = Tevaluate,NR\_Intra + TSI-NR

Tevaluate,NR\_Intra = 25.6 s; as specified in TS 38.133 [6] clause 4.2.2.3.

TSI-NR = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but the test allows 27 seconds).

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

#### 7.1.1.2 NR SA FR2-FR2 cell re-selection

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.4.

7.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.2.

7.1.1.2.4 Test description

7.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.2.4.1-1.

Table 7.1.1.2.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection

|  |  |  |
| --- | --- | --- |
| Configuration | Description for serving cell | Description for target cell |
| 7.1.1.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.2-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 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 7.1.1.2.4.1-2.

Table 7.1.1.2.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.1.1.2.4.1-3.

2. Message contents are defined in clause 7.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

Table 7.1.1.2.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
|  | Neighbour cell |  | 1, 2 | Cell1 |  |
| T1 end condition | Active cell |  | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| Neighbour cells |  | 1, 2 | Cell2 |
| T3 end condition | Active cell |  | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
|  | Neighbour cell |  | 1, 2 | Cell1 |  |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| 2 | SSB.2 FR2 |  |
| SMTC configuration | |  | 1, 2 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | 35 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2 | 95 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

7.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 7.1.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.

3. Void.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

5. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 27 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6a.  
Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

6a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.2.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.2.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 87 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 11a.  
Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 12.

11a.The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 2.

12. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

13. Repeat step 3-12 until a test verdict has been achieved.  
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” 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 clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

7.1.1.2.4.3 Message contents

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

Table 7.1.1.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.2-1 for NR Cell 1 |
| Default RRC messages and information elements contents exceptions |  |

Table 7.1.1.2.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 190 |  |  |
| } |  |  |  |

Table 7.1.1.2.4.3-3: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -70 | Actual value is -62\*2 = -140dBm | 7.1.1.2-1 and Cell 1 |
|  | | -68 | Actual value is -62\*2 = -136dBm | 7.1.1.2-2 and Cell 1 |
|  | | -62 | Actual value is -62\*2 = -124dBm | 7.1.1.2-1 and Cell 2 |
|  | | -60 | Actual value is -62\*2 = -120dBm | 7.1.1.2-2 and Cell 2 |
| } | |  |  |  |
| } | |  |  |  |

Table 7.1.1.2.4.3-4: SIB2(Cell2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 with condition NR Cell 2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | 31 | Actual value is 31\*2 = 62dBm |  |
| threshServingLowP | 31 | Actual value is 31\*2 = 62dBm |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.2.4.3-5: SIB4 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | Entry 1 |  |
| q-RxLevMin | -70 | Actual value = -70\*2 = -140dBm | 7.1.1.2-1 |
|  | -68 | Actual value = -68\*2 = -136dBm | 7.1.1.2-2 |
| threshX-HighP | 16 | Actual value is 16\*2 = 32dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.2.4.3-6: SIB4 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | Entry 1 |  |
| q-RxLevMin | -62 | Actual value = -62\*2 = -124dBm | 7.1.1.2-1 |
|  | -60 | Actual value = -60\*2 = -120dBm | 7.1.1.2-2 |
| threshX-LowP | 9 | Actual value = 9\*2 = 18dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.1.1.2.5 Test requirement

Tables 7.1.1.2.4.1-3 and 7.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 7.1.1.2.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1, 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET parameters |  | 1, 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| OCNG Pattern |  | 1, 2 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1, 2 | 66 | | | 66 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | | -124 Note 6 | | |
| 2 | -137 | | | -121 Note 6 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A. 9.1 | | | Setup 1 defined in A. 9.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | | | |
| Note 5 | dB | 1 | 810.06 | 810.06 | 87.56 | -3-3.34 | -infinity | 88.06 |
| 2 |
| Note2 | dBm/SCS | 1 | -93 | | | | | |
| 2 | -90 | | | | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | | | |
| 2 |
|  | dB | 1 | 810.5 | 810.5 | 8 | -3-2.9 Note 6 | -infinity | 88.5 |
| 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85-82.5 | -85-82.5 | -85 | -96-95.9 | -infinity | -85-84.5 |
| 2 | -82-79.5 | -82-79.5 | -82 | -93-92.9 | -infinity | -82-91.5 |
| Io | dBm/95.04 MHz | 1 | -55.37-53.11 | -55.37-53.11 | -55.37-55.34 | -62.25-62.18 | -infinity-63.98 | -55.37-54.91 |
| 2 | -53.11-52.37 | -53.11-52.37 | -55.34-52.37 | -62.18-59.25 | -63.98-infinity | -54.91-52.37 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | | 62 Note 6 | | |
| Threshx, highP | dB | 1, 2 | 32 Note 6 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2 | 44 | | | 62 Note 6 | | |
| Threshx, lowP | dB | 1, 2 | 50 | | | 18 Note 6 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including the test tolerance given in Annex F. | | | | | | | | |

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on cell 2.

The cell re-selection delay to a higher priority cell test requirement in this case is expressed as:

Cell re-selection delay to a higher priority cell = Thigher\_priority\_search + Tevaluate, NR\_ inter + TSI-NR

Thigher\_priority\_search = 60 s, as specified in TS 38.133 [6] clause 4.2.2.7;

Tevaluate, NR\_ inter = 25.6 s, as specified in TS 38.133 [6] clause 4.2.2.4;

TSI-NR = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a higher priority cell shall be less than a total of 86.88 seconds in this test case (note: this gives a total of 86.88 seconds but this test allows 87 seconds)

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on cell 1.

The cell re-selection delay to a lower priority cell test requirement in this case is expressed as:

Cell re-selection delay to a lower priority cell = Tevaluate, NR\_ inter + TSI-NR

Tevaluate, NR\_ inter = 25.6 s, as specified in TS 38.133 [6] clause 4.2.2.4;

TSI-NR = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a lower priority cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but this test allows 27 seconds)

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

#### 7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

7.1.1.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.3.

7.1.1.3.4 Test description

7.1.1.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.3.4.1-1.

Table 7.1.1.3.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.1.1.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.3-2 | 240 kHz SSB SCS, 100 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 7.1.1.3.4.1-2.

Table 7.1.1.3.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.1.1.3.4.1-3.

2. Message contents are defined in clause 7.1.1.3.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.3.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell1 | The UE camps on cell 1 in the initial phase |
|  | Neighbour cells |  | 1, 2 | Cell2 |  |
| T1 end condition | Active cell |  | 1, 2 | Cell2 | The UE reselects to cell 2 during T1 period |
|  | Neighbour cells |  | 1, 2 | Cell1 |
| Final condition | Active cell |  | 1, 2 | Cell1 | The UE reselects to cell 1 during T2 period |
| Neighbour cells |  | 1,2 | Cell2 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | |  | 1, 2 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | 100 |  |
| T2 | | s | 1, 2 | 100 |  |

7.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

*- lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.3.5-1;

*- cellEdgeEvaluation* [2] is not configured;

*- combineRelaxedMeasCondition* [2]is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, 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 7.1.1.3.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC\_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.3.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.1.1.3.4.3 Message contents

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

Table 7.1.1.3.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions |  |

Table 7.1.1.3.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 190 |  |  |
| } |  |  |  |

Table 7.1.1.3.4.3-2A: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -60 | Actual value is -60\*2 = -120dBm | 7.1.1.3-1 |
|  | | -58 | Actual value is -58\*2 = -116dBm | 7.1.1.3-2 |
| } | |  |  |  |
| } | |  |  |  |

Table 7.1.1.3.4.3-3: SIB2

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| q-RxLevMin | -60 | Actual value is -60\*2 = -120dBm | 7.1.1.3-1 |
|  | -58 | Actual value is -58\*2 = -116dBm | 7.1.1.3-2 |
| s-IntraSearchP | 25 | Actual value is 25\*2 = 50dB |  |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB6 |  |  |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

7.1.1.3.5 Test requirement

Tables 7.1.1.3.4.1-3 and 7.1.1.3.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

Table 7.1.1.3.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  |  | T1 | T2 | | T1 | | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC |  | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| configuration |  | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC configuration |  | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| RMC configuration |  | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration |  | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
|  |  | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern |  | 1, 2 | OP.4 | | | OP.4 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | | | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -120 Note 6 | | | -120 Note 6 | | |
|  |  | 2 | -117 Note 6 | | | -117 Note 6 | | |
| SSearchDeltaP | dB | 1, 2 | 6 | | | 6 | | |
| TSearchDeltaP | s | 1,2 | 5 | | | 5 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.9.1 | | | Setup 1 defined in A.9.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | | |
| Note 5 | dB | 1 | -3.34 | 1.61 | | 1.61 | -3.64 | |
|  |  | 2 |
| Note2 | dBm/SCS | 1 | -93 | | | | | |
|  |  | 2 | -90 | | | | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | | | |
|  |  | 2 |  | | | | | |
|  | dB | 1 | -2.9Note 6 | 2.05 Note 6 | | 2.05 Note 6 | -2.9 Note 6 | |
|  |  | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -95.9 | -90.9 | | -90.9 | -95.9 | |
|  |  | 2 | -92.9 | -87.9 | | -87.9 | -92.9 | |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -67.37 | -65.01 | | -65.01 | -67.37 | |
| 2 | -64.36 | -62.00 | | -62.00 | -64.36 | |
| Treselection | s | 1, 2 | 0 | 0 | | 0 | 0 | |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including the test tolerance given in Annex F. | | | | | | | | |

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

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

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = Tevaluate,NR\_Intra + TSI-NR

Tevaluate,NR\_Intra = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

TSI-NR = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

#### 7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

7.1.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.4.

7.1.1.4.4 Test description

7.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.4.4.1-1.

Table 7.1.1.4.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.1.1.4-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.4-2 | 240 kHz SSB SCS, 100 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 7.1.1.4.4.1-2.

Table 7.1.1.4.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.1.1.4.4.1-3.

2. Message contents are defined in clause 7.1.1.4.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.4.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell1 | The UE camps on cell 1 in the initial phase |
|  | Neighbour cells |  | 1, 2 | Cell2 |  |
| T1 end condition | Active cell |  | 1, 2 | Cell2 | The UE reselects to cell 2 during T1 period |
|  | Neighbour cells |  | 1, 2 | Cell1 |
| Final condition | Active cell |  | 1, 2 | Cell1 |  |
| Neighbour cells |  | 1,2 | Cell2 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | |  | 1, 2 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | 100 |  |
| T2 | | s | 1, 2 | 100 |  |

7.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

*- lowMobilityEvaluation* [2] is not configured;

*- cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.4.5-1;

*- combineRelaxedMeasCondition* [2]is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, 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 7.1.1.4.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC\_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.4.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.1.1.4.4.3 Message contents

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

Table 7.1.1.4.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions |  |

Table 7.1.1.4.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 190 |  |  |
| } |  |  |  |

Table 7.1.1.4.4.3-2A: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -60 | Actual value is -60\*2 = -120dBm | 7.1.1.4-1 |
|  | | -58 | Actual value is -58\*2 = -116dBm | 7.1.1.4-2 |
| } | |  |  |  |
| } | |  |  |  |

Table 7.1.1.4.4.3-3: SIB2 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| q-RxLevMin | -60 | Actual value is -60\*2 = -120dBm | 7.1.1.4-1 |
|  | -58 | Actual value is -58\*2 = -116dBm | 7.1.1.4-2 |
| s-IntraSearchP | 25 | Actual value is 25\*2 = 50dB |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 | Not present |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchThresholdP-r16 | 4 | Actual value is 4\*2 = 8dBm |  |
| } |  |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

7.1.1.4.5 Test requirement

Tables 7.1.1.4.4.1-3 and 7.1.1.4.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

Table 7.1.1.4.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  |  | T1 | T2 | | T1 | | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC |  | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| configuration |  | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC configuration |  | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| RMC configuration |  | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration |  | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
|  |  | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern |  | 1, 2 | OP.4 | | | OP.4 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | | | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -120 Note 6 | | | -120 Note 6 | | |
|  |  | 2 | -117 Note 6 | | | -117 Note 6 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.9.1 | | | Setup 1 defined in A.9.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | | |
| Note 5 | dB | 1 | -3.34 | 1.61 | | 1.61 | -3.34 | |
|  |  | 2 |
| Note2 | dBm/SCS | 1 | -93 | | | | | |
|  |  | 2 | -90 | | | | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | | | |
|  |  | 2 |  | | | | | |
|  | dB | 1 | -2.90 Note 6 | 2.05 Note 6 | | 2.05 Note 6 | -2.90 Note 6 | |
|  |  | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -95.9 | -90.9 | | -90.9 | -95.9 | |
|  |  | 2 | -92.9 | -87.9 | | -87.9 | -92.9 | |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -67.37 | -65.01 | | -65.01 | -67.37 | |
| 2 | -64.36 | -62.00 | | -62.00 | -64.36 | |
| Treselection | s | 1, 2 | 0 | 0 | | 0 | 0 | |
| SSearchThresholdP |  | 1, 2 | 8 Note 6 | 8 Note 6 | | 8 Note 6 | 8 Note 6 | |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including the test tolerance given in Annex F. | | | | | | | | |

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

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

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = Tevaluate,NR\_Intra + TSI-NR

Tevaluate,NR\_Intra = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

TSI-NR = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

#### 7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

7.1.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.5.

7.1.1.5.4 Test description

7.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.5.4.1-1.

Table 7.1.1.5.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.1.1.5-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.5-2 | 240 kHz SSB SCS, 100 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 7.1.1.5.4.1-2.

Table 7.1.1.5.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.1.1.5.4.1-3.

2. Message contents are defined in clause 7.1.1.5.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.5.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell2 | The UE camps on cell2 and fulfils low mobility (*lowMobilityEvalutation* [2]) criterion. |
|  | Neighbour cell |  | 1, 2 | Cell1 |
| T1 final condition | Active cell |  | 1, 2 | Cell1 | The UE reselects to low priority cell1 during T1 |
|  | Neighbour cell |  | 1, 2 | Cell2 |
| T2 final condition | Active cell |  | 1, 2 | Cell2 | The UE reselects to high priority cell2 during T2 |
|  | Neighbour cell |  |  | Cell1 |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
|  | | 2 | SSB.2 FR2 |  |
| SMTC configuration | |  | 1, 2 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | 85 | T1 needs to be long enough to allow cell re-selection to already known cell1 |
| T2 | | s | 1, 2 | 85 | T2 needs to be long enough to allow cell re-selection to already known cell2 |

7.1.1.5.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

*- lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.5.5-1;

*- cellEdgeEvaluation* [2] is not configured;

*- combineRelaxedMeasCondition* [2]is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, 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 7.1.1.5.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC\_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.5.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.

8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”

9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.  
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” 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 clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

7.1.1.5.4.3 Message contents

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

Table 7.1.1.5.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |

Table 7.1.1.5.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 190 |  |  |
| } |  |  |  |

Table 7.1.1.5.4.3-2A: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -70 | Actual value is -62\*2 = -140dBm | 7.1.1.5-1 and Cell 1 |
|  | | -68 | Actual value is -62\*2 = -136dBm | 7.1.1.5-2 and Cell 1 |
|  | | -62 | Actual value is -62\*2 = -124dBm | 7.1.1.5-1 and Cell 2 |
|  | | -60 | Actual value is -62\*2 = -120dBm | 7.1.1.5-2 and Cell 2 |
| } | |  |  |  |
| } | |  |  |  |

Table 7.1.1.5.4.3-3: SIB2 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | 31 | Actual value is 31\*2 = 62dBm | Cell 2 |
| threshServingLowP | 31 | Actual value is 31\*2 = 62dBm | Cell 2 |
| cellReselectionPriority | 4 |  | Cell 1 |
|  | 5 |  | Cell 2 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB12 |  |  |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.5.4.3-4: SIB4 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | Entry 1 |  |
| q-RxLevMin | -70 | Actual value = -70\*2 = -140dBm | 7.1.1.2-1 |
|  | -68 | Actual value = -68\*2 = -136dBm | 7.1.1.2-2 |
| threshX-HighP | 16 | Actual value is 16\*2 = 32dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.5.4.3-5: SIB4 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | Entry 1 |  |
| q-RxLevMin | -62 | Actual value = -62\*2 = -124dBm | 7.1.1.2-1 |
|  | -60 | Actual value = -60\*2 = -120dBm | 7.1.1.2-2 |
| threshX-LowP | 9 | Actual value = 9\*2 = 18dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.1.1.5.5 Test requirement

Tables 7.1.1.5.4.1-3 and 7.1.1.5.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

Table 7.1.1.5.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1, 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters |  | 1, 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| RMSI CORESET RMC configuration |  | 1, 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | -124 Note6 | |
|  |  | 2 | -137 | | -121 Note6 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| Qhysts | dB | 1, 2 | 0 | | 0 | |
| Qoffsets, n | dB | 1, 2 | 0 | | 0 | |
| Cell\_selection\_and\_reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumptionNote 4 |  | 1, 2 | Rough | | Rough | |
| Note 5 | dB | 1, 2 | 10.06 | [87.56 | -3.34-3 | 8.06[8] |
| Note2 | dBm/SCS | 1 | -93 | | -93 | |
| 2 | -90 | | -90 | |
| Note2 | dBm/15 kHz | 1, 2 | -102 | | -102 | |
|  | dB | 1, 2 | 10.58 | 8 | -2.9 Note6-3 | 8.58 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.5-85 | -85-85 | -95.9-96 | -84.5-85 |
|  |  | 2 | -79.5-82 | -82-82 | -92.9-93 | -81.5-82 |
| Io | dBm/95.04 MHz | 1 | -53.11-55.37 | -55.34-55.37 | -62.18-62.25 | -54.91-55.37 |
|  |  | 2 | -53.11-52.37 | -55.34-52.37 | -62.18-59.25 | -54.91-52.37 |
| TreselectionNR | s | 1, 2 | 0 | | 0 | |
| SnonintrasearchP | dB | 1, 2 | 50 | | Not sent | |
| SSearchDeltaP | dB | 1, 2 | 12 Note6 | | 12 Note6 | |
| TSearchDeltaP | s | 1, 2 | 5 | | 5 | |
| Threshx, high | dB | 1, 2 | 32 Note6 | | 48 | |
| Threshserving, low | dB | 1, 2 | 44 | | 62 Note6 | |
| Threshx, low | dB | 1, 2 | 50 | | 18 Note6 | |
| Propagation Condition |  | 1, 2 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including the test tolerance given in Annex F. | | | | | | |

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR

Where:

Tevaluate, NR\_ inter as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling low mobility criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

#### 7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

7.1.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.6.

7.1.1.6.4 Test description

7.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.6.4.1-1.

Table 7.1.1.6.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.1.1.6-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.6-2 | 240 kHz SSB SCS, 100 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 7.1.1.6.4.1-2.

Table 7.1.1.6.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.1.1.6.4.1-3.

2. Message contents are defined in clause 7.1.1.6.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.6.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell2 | The UE camps on cell2 and fulfils not-at-cell edge (*cellEdgeEvaluation* [2]) criterion. |
|  | Neighbour cell |  | 1, 2 | Cell1 |  |
| T1 final condition | Active cell |  | 1, 2 | Cell1 | The UE reselects to low priority cell1 during T1 |
| Neighbour cell |  | 1, 2 | Cell2 |  |
| T2 final condition | Active cell |  | 1, 2 | Cell2 | The UE reselects to high priority cell2 during T2 |
| Neighbour cell |  | 1, 2 | Cell1 |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
|  | | 2 | SSB.2 FR2 |  |
| SMTC configuration | |  | 1, 2 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | 85 | T1 needs to be long enough to allow cell re-selection to already known cell. |
| T2 | | s | 1, 2 | 85 | T2 needs to be long enough to allow cell re-selection to already known cell. |

7.1.1.6.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

*- lowMobilityEvaluation* [2] is not configured;

*- cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.6.5-1;

*- combineRelaxedMeasCondition* [2]is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, 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 7.1.1.6.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC\_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.6.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.

8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”

9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.  
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” 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 clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

7.1.1.6.4.3 Message contents

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

Table 7.1.1.6.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |

Table 7.1.1.6.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { |  |  |  |
| prach-ConfigurationIndex | 190 |  |  |
| } |  |  |  |

Table 7.1.1.6.4.3-2A: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -70 | Actual value is -62\*2 = -140dBm | 7.1.1.6-1 and Cell 1 |
|  | | -68 | Actual value is -62\*2 = -136dBm | 7.1.1.6-2 and Cell 1 |
|  | | -62 | Actual value is -62\*2 = -124dBm | 7.1.1.6-1 and Cell 2 |
|  | | -60 | Actual value is -62\*2 = -120dBm | 7.1.1.6-2 and Cell 2 |
| } | |  |  |  |
| } | |  |  |  |

Table 7.1.1.6.4.3-3: SIB2 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | 31 | Actual value is 31\*2 = 62dBm | Cell 2 |
| threshServingLowP | 31 | Actual value is 31\*2 = 62dBm | Cell 2 |
| cellReselectionPriority | 4 |  | Cell 1 |
|  | 5 |  | Cell 2 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 | Not present |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchThresholdP-r16 | 18 | Actual value = 18\*2 = 36dB | Cell 1 |
|  | 6 | Actual value = 6\*2 = 12dB | Cell 2 |
| } |  |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.6.4.3-4: SIB4 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | Entry 1 |  |
| q-RxLevMin | -70 | Actual value = -70\*2 = -140dBm | 7.1.1.6-1 |
|  | -68 | Actual value = -68\*2 = -136dBm | 7.1.1.6-2 |
| threshX-HighP | 16 | Actual value is 16\*2 = 32dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.1.1.6.4.3-5: SIB4 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | Entry 1 |  |
| q-RxLevMin | -62 | Actual value = -62\*2 = -124dBm | 7.1.1.6-1 |
|  | -60 | Actual value = -60\*2 = -120dBm | 7.1.1.6-2 |
| threshX-LowP | 9 | Actual value = 9\*2 = 18dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.1.1.6.5 Test requirement

Tables 7.1.1.6.4.1-3 and 7.1.1.6.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

Table 7.1.1.6.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1, 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters |  | 1, 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| RMSI CORESET RMC configuration |  | 1, 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | -124 Note 6 | |
|  |  | 2 | -137 | | -121 Note 6 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| Qhysts | dB | 1, 2 | 0 | | 0 | |
| Qoffsets, n | dB | 1, 2 | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumptionNote 4 |  | 1, 2 | Rough | | Rough | |
| Note 5 | dB | 1, 2 | 10.06 | 7.56 | -3.34 | 8.06 |
| Note2 | dBm/SCS | 1 | -93 | | -93 | |
| 2 | -90 | | -90 | |
| Note2 | dBm/15 kHz | 1, 2 | -102 | | -102 | |
|  | dB | 1, 2 | 10.5 | 8 | -2.9 Note 6 | 8.5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.5 | -85 | -95.9 | -84.5 |
|  |  | 2 | -79.5 | -82 | -92.9 | -81.5 |
| Io | dBm/95.04 MHz | 1 | -53.11 | -55.34 | -62.18 | -54.91 |
|  |  | 2 | -53.11 | -55.34 | -62.18 | -54.91 |
| SSearchThresholdP |  | 1, 2 | 35 | 35 | 12 Note 6 | 12 Note 6 |
| TreselectionNR | s | 1, 2 | 0 | | 0 | |
| SnonintrasearchP | dB | 1, 2 | 50 | | Not sent | |
| Threshx, high | dB | 1, 2 | 32 Note 6 | | 48 | |
| Threshserving, low | dB | 1, 2 | 44 | | 62 Note 6 | |
| Threshx, low | dB | 1, 2 | 50 | | 18Note 6 | |
| Propagation Condition |  | 1, 2 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including the test tolerance given in Annex F. | | | | | | |

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR

Where:

Tevaluate, NR\_ inter as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling not-at-cell edge criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 7.2 RRC\_INACTIVE state mobility

### 7.2.1 Small Data Transmission

#### 7.2.1.0 Minimum conformance requirements

##### 7.2.1.0.1 Minimum conformance requirements for CG-SDT TA validation

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available value as specified in subclause 7.1.2 of TS 38.133 [6]) the serving cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration (see TS 38.331 [13]).

When *cg-SDT-RSRP-ChangeThreshold* (see TS 38.331 [13]) is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 of TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available value as specified in subclause 7.1 of TS 38.133 [6] provided that

- the first RSRP (RSRP1) measurement and the second RSRP (RSRP2) measurements used in the TA validation are valid measurements and,

- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 of TS 38.321 [12].

RSRP1 and RSRP2 are considered valid provided that the conditions in Table 7.2.1.0.1-1 are met for FR2-1.

Table 7.2.1.0.1-1 Valid measurement for FR2-1

|  |  |
| --- | --- |
| Measurement | FR2-1 |
| RSRP1 | (T1 – max(480ms, 8\*SMTC periodicity)) ≤ T1’ ≤ (T1 + max(480ms, 8\*SMTC periodicity)) |
| RSRP2 | (T2 – max(480ms, 8\*SMTC periodicity)) ≤ T2’ ≤ T2 |

If at least one of RSRP1 and RSRP2 is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using RSRP1 and RSRP2 and shall not transmit using CG-SDT. Additionally, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when

- *RRCRelease* with CG-SDT configuration (see TS 38.331 [13]) is received

- the latest TA is received if TA is received while in RRC\_INACTIVE state.

- T1’ is the time when the UE has completed RSRP1.

- T2 is the time when the UE performs TA validation as defined in clause 5.27.2 of TS 38.321 [12] for transmission using CG-SDT.

- T2’ is the time when the UE has completed RSRP2.

- TDRX is the DRX cycle length in ms.

- M1 is the scaling factor as defined in clause 4.2.2.2 of TS 38.133 [6].

The normative reference for this requirement is TS 38.133 [6] clause 5.5.2 and 5.5.3.

#### 7.2.1.1 TA Validation for CG-SDT in FR2

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure, some parameters are not complete in RAN4. In particular, timers T1, T2, T3, T4, T5 are missing.

- Message contents

- Test requirements are not completed in RAN4

- TT analysis is missing

- Annex F

7.2.1.1.1 Test Purpose

The purpose of this test is to verify that the UE correctly performs TA validation for CG-SDT. This test will partly verify the TA validation requirements in clause 5.5.3 of TS 38.133 [6].

7.2.1.1.2 Test Applicability

This test applies to all types of NR UE from Release 17 onwards that supports transmission of data and/or signalling over allowed radio bearers in RRC\_INACTIVE state via configured grant type 1 (i.e., CG-SDT), as specified in TS 38.331 [13].

7.2.1.1.3 Minimum Conformance Requirements

The minimum conformance requirements are specified in clause 7.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.2.1.1.

7.2.1.1.4 Test Description

7.2.1.1.4.1 Initial conditions

This test can be run in the configuration defined in Table 7.2.1.1.4.1-1.

Table 7.2.1.1.4.1-1: Supported test configurations for FR2 PCell

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 7.2.1.1-1 | 1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.2.1.1.4.1-2.

Table 7.2.1.1.4.1-2: Initial conditions for TA Validation for CG-SDT in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration from Table 7.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.2.1.1.4.1-3.

2. Message contents are defined in clause 7.2.1.1.4.3.

3. There is only one NR Cell (Cell 1) specified in the test, configured as PCell in FR2. The Cell 1 is configured according to the settings in Annex C.1.1 and C.1.2.

Table 7.2.1.1.4.1-3: General test parameters for TA validation for CG-SDT in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Duplex mode | Config 1 |  | TDD |
| BWchannel | Config 1 | MHz | 100: NRB,c = 66 |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 DD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 kHz |
| PRACH Configuration | Config 1 |  | Table A.3.8.3.4 [6] |
| OCNG parameters | |  | OP.5 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| DRX | | s | 1.28 |
| cg-SDT-RSRP-ThresholdSSB | | dBm | -110 |
| cg-SDT-RSRP-ChangeThreshold | | dB | [8] |
| cg-SDT-TimeAlignmentTime | |  | infinity |
| CG-SDT resource period | | ms | 40 |
| T1 | | s | [TBD] |
| T2 | | s | [TBD] |
| T3 | | s | [TBD] |
| T4 | | s | [TBD] |
| T5 | | S | [TBD] |

7.2.1.1.4.2 Test procedure

The test consists of a single cell (Cell 1), configured as PCell in FR2 and the UE configured with two CG-SDT configurations when entering/during RRC Inactive state. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.2.1.1.4.2-1 shows the variation of the RSRP level in the active cell during the entire test, both sub-tests included.

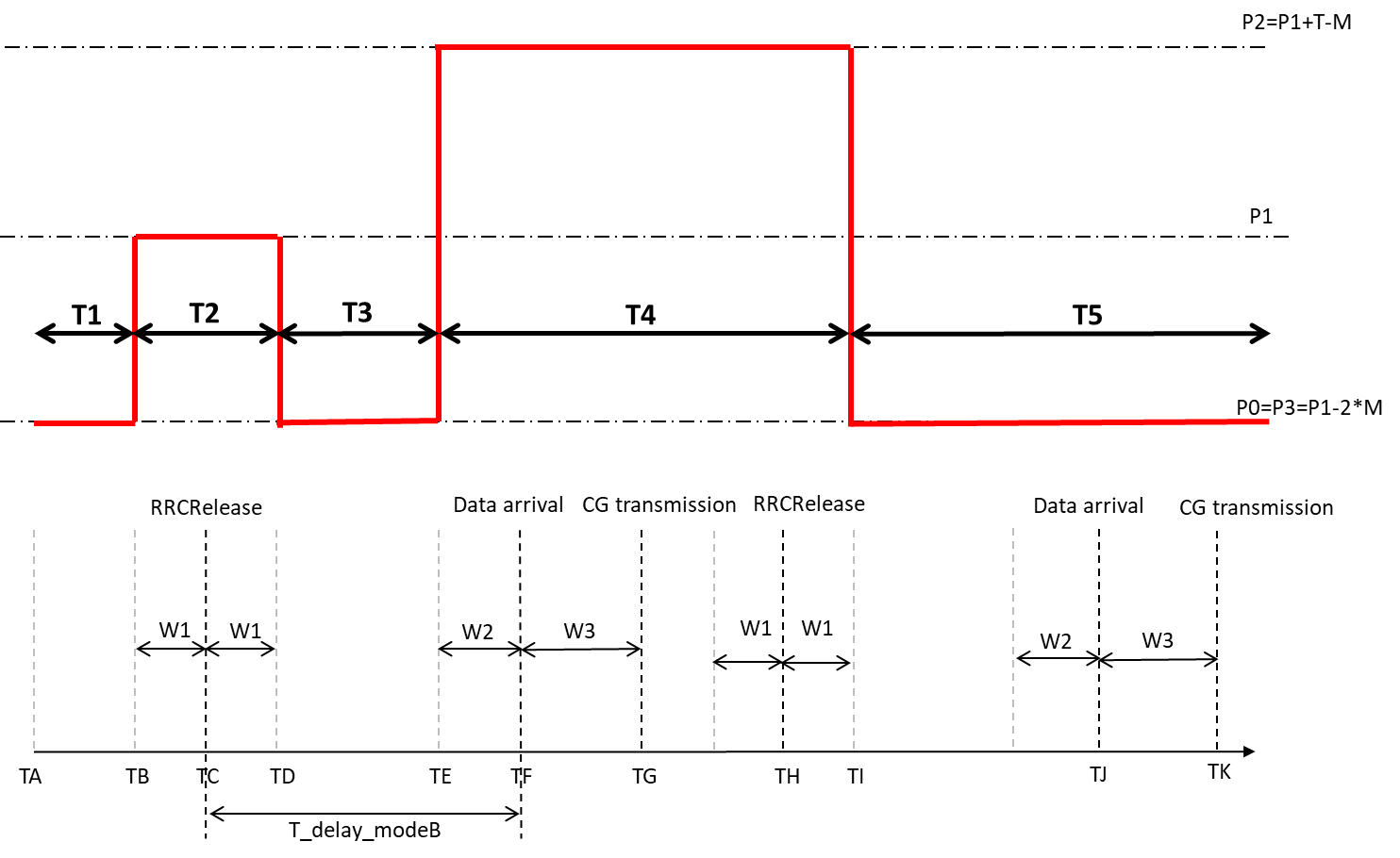


Figure 7.2.1.1.4.2-1: RSRP variation for TA validation for CG-SDT

Time-point TA is the starting point of the test. Prior to time point TA, the UE shall be fully synchronized and registered to PCell (Cell 1) and have entered into RRC connected mode.

Time-point TB is T1 duration after TA, i.e., TB = TA + T1.

Time-point TC is the time when ‘UE Test Loop Mode B’ command (with ‘T\_delay\_modeB’ timer configured) and RRC Release message with CG-SDT configuration for ‘Subtest 1’ are received at the UE and is W1[+Y] duration after TB where W1 = max(480ms, 8\*SMTC periodicity)), i.e., TC = TB + max(480ms, 8\*SMTC periodicity)) [+Y].

Time-point TD is W1 duration after TC or T2 duration after TB, i.e., TD = TC + max(480ms, 8\*SMTC periodicity)) = TB + T2.

Time-point TE is T3 duration after TD and must be W2 before TF, i.e., TE = TD + T3 = TF – W2 where W2 = max(480ms, 8\*SMTC periodicity)).

Time-point TF is the time when ‘T\_delay\_modeB’ timer expires which trigger UL data arrival at UE lower layer i.e., TF = TC + T\_delay\_modeB.

Time-point TG is the time when UE transmits with CG-SDT. After time point TF, test equipment observes whether UE transmits with CG-SDT within 640ms + Z after TF.

Time-point TH is the time when second ‘UE Test Loop Mode B’ command (with ‘T\_delay\_modeB’ timer reconfigured) and second RRC Release message with CG-SDT configuration for ‘Subtest 2’ are received at the UE and delay between TG and TH is FFS in RAN4.

Time-point TI is T4 duration after TE and W1 duration after TH, i.e., TI = TE + T4 = TH + W1.

Time-point TJ is the time when ‘T\_delay\_modeB’ timer configured in second ‘UE Test Loop Mode B’ command expires which trigger UL data arrival at UE lower layer, i.e., TJ = TH + T\_delay\_modeB.

Time-point TK is the end point of the first iteration of the test and is T5 duration after TI, i.e., TK = TI + T5.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.2.1.1.5-1.

3. The test starts at time-point TA before which SS sets the transmit power to P0.

4. At time-point TB, the SS changes the power level from P0 to P1.

5. At time point TC, the SS sends CLOSE UE TEST LOOP message (having a non-zero value of T\_delay\_modeB timer) and RRCRelease message with CG-SDT configuration to the UE, and the UE enters RRC\_INACTIVE state.

6. At time-point TD, the SS changes the power level from P1 to P0.

7. At time-point TE, the SS changes the power level from P0 to P2.

8. At time-point TF, the T\_delay\_modeB timer expires which trigger UL data arrival at UE lower layer.

9. At time-point TG, the UE transmits with CG-SDT.

10. Check 1: If UE transmits with CG-SDT within 640ms + Z after TF, i.e., if TF TG 640 ms + Z, sub-test ‘1’ is passed.

11. SS sends OPEN UE TEST LOOP message to UE.

12. UE sends OPEN UE TEST LOOP COMPLETE message to SS.

13. At time-point TH, the SS sends CLOSE UE TEST LOOP message (having a non-zero value of T\_delay\_modeB timer) and second RRCRelease message with CG-SDT configuration to UE, and the UE remains in RRC\_INACTIVE state.

14. At time-point TI, the SS changes the power level from P2 to P3.

15. At time-point TJ, the T\_delay\_modeB timer expires which trigger UL data arrival at UE lower layer.

16. Check 2: If UE does not transmit with CG-SDT between TJ and TK, sub-test ‘2’ is passed.

17. SS sends OPEN UE TEST LOOP message to UE.

18. UE sends OPEN UE TEST LOOP COMPLETE message to SS.

19. Verdict: If both sub-tests ‘1’ and ‘2’ passed, test passes. If any of the sub-test fail, the test fails.

20. The test ends at time-point TK.

7.2.1.1.4.3 Message contents

TBD

7.2.1.1.5 Test Requirements

Tables 7.2.1.1.4.1-3 and 7.2.1.1.5-1 define the general parameters and cell specific parameters for NR SA FR2 CG-SDT TA validation test.

Table 7.2.1.1.5-1: Cell specific test parameters TA validation for CG-SDT in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 4 | |  | Rough | | | | |
| 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 |  | | | | |
|  | Config 1 | dBm/15kHz | -100 + TT | | | | |
|  | Config 1 | dBm/SCS | -100 + TT | | | | |
|  | Config 1 | dB | [0] + TT | [13] + TT | [0] +TT | [24.5] +TT | [0] +TT |
|  | Config 1 | dB | [0] + TT | [13] + TT | [0] + TT | [24.5] + TT | [0] + TT |
| SS-RSRP | Config 1 | dBm/SCS | [-100] + TT | [-87] + TT | [-100] + TT | [-75.5] + TT | [-100] + TT |
| Io | Config 1 | dBm/95.04 MHz | [-68] + TT | [-57.8] + TT | [-68] + TT | [-46.50] + TT | [-68] + TT |
| Propagation condition | |  | AWGN | | | | |
| 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 signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | |

The UE behaviour in each test during time durations shall be as follows:

During T4, UE shall transmit UL data with CG-SDT within 640ms + Z after time point TF.

During T5, UE shall not transmit UL data with CG-SDT.

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

## 7.3 RRC\_CONNECTED state mobility

### 7.3.1 Handover

#### 7.3.1.0 Minimum conformance requirements

##### 7.3.1.0.1 Minimum conformance requirements for NR FR2 – NR FR2 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover ms from the end of the last TTI containing the RRC command:

Dhandover = TRRC\_procedure\_delay + Tinterruption

Where:

Dhandover equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.4.2 of 38.133 [6].

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than Tinterrupt

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Where:

Tsearch is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then Tsearch = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then Tsearch = N\* Trs ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then Tsearch = N\*3\* Trs ms. N = 8 when the target cell is in FR2-1, and N = 12 when the target cell is in FR2-2. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

Tprocessing is time for UE processing. Tprocessing can be up to 20ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

T∆ is time for fine time tracking and acquiring full timing information of the target cell. T∆ = Trs for both known and unknown target cell.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:

- the UE has sent a valid measurement report for the target cell and

- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of 38.133 [6],

- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of 38.133 [6].

otherwise it is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.4.

##### 7.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR2 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover ms from the end of the last TTI containing the RRC command:

Dhandover = TRRC\_procedure\_delay + Tinterruption

Where:

Dhandover equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.5.2 of 38.133 [6].

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When in inter-frequency handover is commanded, the interruption time shall be less than Tinterrupt

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Where:

Tsearch is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then Tsearch = 0 ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then Tsearch = N\*3\* Trs ms. N = 8 when the target cell is in FR2-1, and N = 12 when the target cell is in FR2-2. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

Tprocessing is time for UE processing. Tprocessing can be up 40ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

T∆ is time for fine time tracking and acquiring full timing information of the target cell. T∆ = Trs for both known and unknown target cell.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:

- the UE has sent a valid measurement report for the target cell and

- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of 38.133 [6],

- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of 38.133 [6].

otherwise it is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.5.

##### 7.3.1.0.3 Minimum conformance requirements for NR FR1 – NR FR2 DAPS handover

An FR1-FR2 DAPS handover is synchronous if it meets the conditions in table 7.3.1.0.3-1, otherwise it is asynchronous

Table 7.3.1.0.3-1: Sync condition for FR1-FR2 DAPS handover

|  |  |  |
| --- | --- | --- |
| Frequency Range of the pair of carriers | Maximum receive timing difference between source and target cell (µs) for sync DAPS handover | Maximum transmit timing difference between source and target cell (µs)Note 1 sync DAPS handover |
| Between FR1 and FR2 | 25 | 26.1 |

Procedure delays for the procedure that can command a DAPS handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover1 ms from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

Dhandover1 = TRRC\_procedure + Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Where:

TRRC\_procedure is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [13].

Tsearch, TIU, Tprocessing, T∆ and Tmargin are defined in clause 6.1.1.5.2 of 38.133 [6].

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [13] within Dhandover2.

Dhandover2 = TRRC\_procedure+ Tinterrupt2

Where:

TRRC\_procedure is the RRC procedure delay as specified in clause 12 in TS 38.331 [13].

Tinterrupt2 is defined in clause 6.1.3.4.2 of 38.133 [6].

During Dhandover1, the UE is allowed an interruption of up to Tinterrupt1 on source cell.

For FR1-to-FR2 inter-band handover, Tinterrupt1 is specified in Table 7.3.1.0.3-2.

Table 7.3.1.0.3-2: Tinterrupt1 for FR1-to-FR2 inter-band DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR slot length (ms) | Tinterrupt1 (slots) | |
|  | of source cell | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 5 | 5 |

During Dhandover2, the UE is allowed an interruption of up to Tinterrupt2 on target cell.

For FR1-to-FR2 inter-band handover, Tinterrupt2 is specified in Table 7.3.1.0.3-3.

Table 7.3.1.0.3-3: Tinterrupt2 for FR1-to-FR2 inter-band DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR slot length (ms) | Tinterrupt2 (slots) | |
|  | of target cell | Sync | Async |
| 2 | 0.25 | 5 | 5 |
| 3 | 0.125 | 9 | 9 |

The normative reference for this requirement is TS 38.133 [6] clause 6.1.3.4.

#### 7.3.1.1 NR SA FR1-FR2 Inter-frequency handover; unknown target cell

Editor's Note:

* This test case is incomplete since FR1-FR2 OTA testability is still FFS.
* Test Tolerances are missing
* Connection diagram may require updates for FR1+FR2 scenarios

7.3.1.1.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter frequency handover requirements specified in 38.133 [6] clause 6.1.1.5.

7.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR1 and SA FR2.

7.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.1.

7.3.1.1.4 Test description

7.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.1.4.1-1.

Table 7.3.1.1.4.1-1: NR SA FR1-FR2 Test configurations for Inter-frequency handover

|  |  |
| --- | --- |
| Config | Description |
| 7.3.1.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.1-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 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 7.3.1.1.4.1-2

Table 7.3.1.1.4.1-2: NR SA FR1-FR2 Initial conditions for Inter-frequency handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | [A.3.3.3.1-1] | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.1.1.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.1.4.1-3.

Table 7.3.1.1.4.1-3: NR SA FR1-FR2 General test parameters for Inter-frequency handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤10 |  |

7.3.1.1.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.1.4.1-3 and Table 7.3.1.1.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC\_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.1.5-1. T2 starts.

5. The UE shall transmit *RRCReconfigurationComplete* message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 572 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.1.4.3 Message contents

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

Table 7.3.1.1.4.3-1: NR SA FR1-FR2 Common exception messages for Inter-frequency handover

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig\_KeyChange |

7.3.1.1.5 Test requirements

Table 7.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.1.5-1: NR SA FR1-FR2 Cell specific test parameters for Inter-frequency handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Cell 1 | | | Cell 2 | | |
|  | | | |  | T1 | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | | | |  | N/A | | | Rough | | |
| AoA setup | | | |  | NA | | | Setup 1  as defined in A.9 | | |
| NR RF Channel Number | | | |  | 1 | | | 2 | | |
| Duplex mode | | | Config 1 |  | FDD | | TDD | | | |
|  | | | Config 2,3 |  | TDD | | TDD | | | |
| TDD configuration | | | Config 1 |  | Not Applicable | | TDDConf.3.1 | | | |
|  | | | Config 2 |  | TDDConf.1.1 | | TDDConf.3.1 | | | |
|  | | | Config 3 |  | TDDConf.2.1 | | TDDConf.3.1 | | | |
| BWchannel | | | Config 1 | MHz | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
|  | | | Config 2 |  | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
|  | | | Config 3 |  | 40: NRB,c = 106 | | 100: NRB,c = 66 | | | |
| BWP BW | | | Config 1 | MHz | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
|  | | | Config 2 |  | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
|  | | | Config 3 |  | 40: NRB,c = 106 | | 100: NRB,c = 66 | | | |
| Data RBs allocated | | | Config 1 |  | 52 | | 66 | | | |
| Config 2 | 52 | | 66 | | | |
| Config 3 | 106 | | 66 | | | |
| DRx Cycle | | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | Config 1 |  | SR.1.1 FDD | | SR.3.1 TDD | | | |
|  | | | Config 2 |  | SR.1.1 TDD | | SR.3.1 TDD | | | |
|  | | | Config 3 |  | SR.2.1 TDD | | SR.3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 |  | CR.1.1 FDD | | CR.3.1 TDD | | | |
|  | | | Config 2 |  | CR.1.1 TDD | | CR.3.1 TDD | | | |
|  | | | Config 3 |  | CR.2.1 TDD | | CR.3.1 TDD | | | |
| Control Channel RMC | | | Config 1 |  | CCR.1.1 FDD | | CCR.3.1 TDD | | | |
| Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | | | |
| Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | |  | OP.1 | | | | | |
| SSB configuration | | | Config 1,2 |  | SSB.1 FR1 | | SSB.3 FR2 | | | |
|  | | | Config 3 |  | SSB.2 FR1 | | SSB.3 FR2 | | | |
| SMTC configuration | | | Config 1,2 |  | SMTC.1 | | SMTC.1 | | | |
|  | | | Config 3 |  | SMTC.2 | | SMTC.1 | | | |
| SMTC configuration | | | Config 1,2 |  | SMTC.1 | | SMTC.1 | | | |
|  | | | Config 3 |  | SMTC.2 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | 120 kHz | | | |
|  | | | Config 3 |  | 30 kHz | | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | 120 kHz | | | |
|  | | | Config 3 |  | 30 kHz | | 120 kHz | | | |
| PRACH configuration | | | |  | PRACH.1 FR1 | | PRACH.1 FR2 | | | |
| TRS configuration | | Config 1 | |  | TRS.1.1 FDD | | TRS.2.1 TDD | | | |
|  | | Config 2 | |  | TRS.1.1 TDD | | TRS.2.1 TDD | | | |
|  | | Config 3 | |  | TRS.1.2 TDD | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | |  | N/A | | TCI.State.2 | | | |
| BWP configuration | | | Initial DL BWP |  | DLBWP.0.1 | | DLBWP.0.1 | | | |
|  | | | Dedicated DL BWP |  | DLBWP.1.1 | | DLBWP.1.1 | | | |
|  | | | Initial UL BWP |  | ULBWP.0.1 | | ULBWP.0.1 | | | |
|  | | | Dedicated UL BWP |  | ULBWP.1.1 | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | |  |  | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |  |  | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |  |  | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |  |  | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |  |  | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | | |  |  | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |  |  | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |  |  | |  | | | |
| Note2 | | | | dBm/15kHz | Link only, see clause A.6A | | -104.7+TT | | | |
| Note2 | Config 1,2 | | | dBm/SCS |  | | -95.7+TT | | | |
|  | Config 3 | | |  |  | | -95.7+TT | | | |
|  | | | | dB |  | | -Infinity | | 10+TT | |
|  | | | | dB |  | | -Infinity | | 10+TT | |
| IoNote3 | Config 1,2 | | | dBm/  BW |  | | -66.7+TT | | -56.3+TT | |
|  | Config 3 | | | dBm/  BW |  | | -66.7+TT | | -56.3+TT | |
| Propagation condition | | | | - |  | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 572 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + Tinterrupt, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tinterrupt = 562 ms in the test. Tinterrupt is defined in clause 6.1.1.5.2 of 38.133 [6].

This gives a total of 572 ms.

#### 7.3.1.2 NR SA FR2 Intra-frequency handover; unknown target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.1.2.1 Test purpose

To verify the requirement for the NR FR2 intra frequency handover requirements specified in 38.133 [6] clause 6.1.1.4.

7.3.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR2.

7.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.2.

7.3.1.2.4 Test description

7.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.2.4.1-1.

Table 7.3.1.2.4.1-1: NR SA FR2 Test configurations for Intra-frequency handover

|  |  |
| --- | --- |
| Config | Description |
| 7.3.1.2-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.2.4.1-2

Table 7.3.1.2.4.1-2: NR SA FR2 Initial conditions for Intra-frequency handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.1.2.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.2.4.1-3.

Table 7.3.1.2.4.1-3: NR SA FR2 General test parameters for Intra-frequency handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤10 |  |

7.3.1.2.4.2 Test procedure

The test scenario comprises of one FR2 RF channel with two intra-frequency NR cells. NR Cell 1 is the source PCell and NR Cell 2 is the target Pcell. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.2.4.1-3 and Table 7.3.1.2.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC\_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.2.5-1. T2 starts.

5. The UE shall transmit *RRCReconfigurationComplete* message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 232 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.2.4.3 Message contents

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

Table 7.3.1.2.4.3-1: NR SA FR2 Common exception messages for Intra-frequency handover

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig\_KeyChange |

7.3.1.2.5 Test requirements

Table 7.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.2.5-1: NR SA FR2 Cell specific test parameters for Intra-frequency handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | Rough | | |
| AoA setup | | |  | Setup 1 as defined in A.9 | | | | | | |
| NR RF Channel Number | | |  | **1** | | | | **1** | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | | |  | 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | |  | SR.3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | | |  | CR.3.1 TDD | | | | | | |
| Control Channel RMC | | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | |  | SSB.3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | PRACH.1 FR2 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | | |  | TCI.State.2 | | | | | | |
| 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 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -104.7 | | | | | | |
| Note2 |  | | dBm/SCS | -95.7 | | | | | | |
|  | | | dB | 6 | -1.8 | | -Infinity | | 0 | |
|  | | | dB | 6 | 6 | | -Infinity | | 7 | |
| IoNote3 |  | | dBm/  BW | -59.7 | -56.7 | | -59.7 | | -56.7 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 232 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + Tinterrupt, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tinterrupt = 222 ms in the test. Tinterrupt is defined in clause 6.1.1.4.2 of 38.133 [6].

This gives a total of 232 ms.

#### 7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.1.3.1 Test purpose

To verify the requirement for the NR FR2-NR FR2 inter frequency handover requirements specified in 38.133 [6] clause 6.1.1.4.

7.3.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR2.

7.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.3.

7.3.1.3.4 Test description

7.3.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.3.4.1-1.

Table 7.3.1.3.4.1-1: NR SA FR2-FR2 Test configurations for Inter-frequency handover

|  |  |
| --- | --- |
| Config | Description |
| 7.3.1.3-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.3.4.1-2

Table 7.3.1.3.4.1-2: NR SA FR2-FR2 Initial conditions for Inter-frequency handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.1.3.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.3.4.1-3.

Table 7.3.1.3.4.1-3: NR SA FR2-FR2 General test parameters for Inter-frequency handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤10 |  |

7.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on one FR2 carrier and NR Cell 2 is the target PCell on another FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.3.4.1-3 and Table 7.3.1.3.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC\_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.3.5-1. T2 starts.

5. The UE shall transmit *RRCReconfigurationComplete* message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 552 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.3.4.3 Message contents

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

Table 7.3.1.3.4.3-1: NR SA FR2-FR2 Common exception messages for Inter-frequency handover

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig\_KeyChange |

7.3.1.3.5 Test requirements

Table 7.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.3.5-1: NR SA FR2-FR2 Cell specific test parameters for Inter-frequency handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | Rough | | |
| AoA setup | | |  | Setup 1 as defined in A.9 | | | | | | |
| NR RF Channel Number | | |  | **1** | | | | **2** | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | | |  | 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | |  | SR.3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | | |  | CR.3.1 TDD | | | | | | |
| Control Channel RMC | | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | |  | SSB.3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | PRACH.1 FR2 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | | |  | TCI.State.2 | | | | | | |
| 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 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -104.7 | | | -104.7 | | | |
| Note2 |  | | dBm/SCS | -95.7 | | | -95.7 | | | |
|  | | | dB | 5 | 5 | | -Infinity | | 5 | |
|  | | | dB | 5 | 5 | | -Infinity | | 5 | |
| IoNote3 | Config 1,2 | | dBm/  BW | -60.5 | -60.5 | | -66.7 | | -60.5 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 552 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + Tinterrupt, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tinterrupt = 542 ms in the test. Tinterrupt is defined in clause 6.1.1.4.2 of 38.133 [6].

This gives a total of 552 ms.

#### 7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover

Editor's Note:

* This test case is incomplete since FR1-FR2 OTA testability is still FFS.
* MU and TT analysis is complete for UE PC3 and test frequency f ≤ 40.8 GHz.
* MU and TT analysis is incomplete for test frequency f > 40.8 GHz
* Connection diagram may require updates for FR1+FR2 scenarios

MU and TT analysis is incomplete for UE power class other than PC3.7.3.1.4.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency synchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

7.3.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-frequency DAPS handover.

7.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.4.

7.3.1.4.4 Test description

7.3.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.4.4.1-1.

Table 7.3.1.4.4.1-1: NR SA FR1-FR2 synchronous DAPS handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 7.3.1.4-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.4-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.4-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 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 7.3.1.4.4.1-2

Table 7.3.1.4.4.1-2: Initial conditions for NR SA FR1-FR2 synchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | [A.3.3.3.1-1] | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.1.4.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.4.4.1-3 below, with A4-Threshold modified by Test Tolerance.

Table 7.3.1.4.4.1-3: General test parameters for NR SA FR1-FR2 synchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A4-Threshold | | dBm | -120 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | μs | 33 | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in 38.133 [6] Table 6.1.3.4.2-2 for synchronous DAPS HO |
| T5 | | ms | 100 |  |

7.3.1.4.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.4.4.1-3 and Table 7.3.1.4.4.1-4 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2.

Before the start of T2, the UE is configured with event A4 triggered measurement reporting on target carrier and measurement gaps (gap pattern ID # 0). From start of T2, the Cell 2 becomes detectable. The UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A4, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay Dhandover1 for target cell addition need to be verified.

T4 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within Dhandover2

From start of T5, the UE shall stop sending periodical CSI report on Cell 1.

The test sequence shall be carried out in RRC\_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A4 triggered measurement reporting on the inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively.

7. UE shall transmit a *MeasurementReport* message triggered by Event A4.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *reconfigurationWithSync* message the SS shall switch the power settings from T2 to T3 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within Dhandover1 from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

- Dhandover1 = 92 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16* = *true* on Cell 2 to the UE. T4 starts when the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *daps-SourceRelease-r16* = *true*.

13. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

14. When T4 expires, T5 starts.

15. If

1. The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

and

1. The UE doesn't send periodical CSI report during entire time period T5.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.4.4.3 Message contents

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

Table 7.3.1.4.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| measConfig | MeasConfig | Table 7.3.1.4.4.3-3 |  |
| nonCriticalExtension SEQUENCE { |  |  |  |
| masterCellGroup SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 7.3.1.4.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.1.4.4.3-2: ServingCellConfig (Table 7.3.1.4.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |

Table 7.3.1.4.4.3-3: MeasConfig (Table 7.3.1.4.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfig[1] CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR(-120) specified in Table H.3.1-4AA | Acutal value of A4-threshold is -120dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.1.4.4.3-4: MeasurementReport (Step 7)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
| Information Element | | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| measurementReport SEQUENCE { | |  |  |  |
| measResults | | MeasResults specified in Table H.3.1-7 with condition INTER-FREQ |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.3.1.4.4.3-5: RRCReconfiguration(Step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig\_NoKeyChange | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| radioBearerConfig | RadioBearerConfig | Table 7.3.1.4.4.3-6 |  |
| nonCriticalExtension SEQUENCE{ |  |  |  |
| masterCellGroup | CellGroupConfig | Table 7.3.1.4.4.3-7 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.1.4.4.3-6: RadioBearerConfig (Table 7.3.1.4.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { |  |  |  |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry |  |  |
| DRB-ToAddMod[1] SEQUENCE { |  | entry 1 |  |
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.  Actual value of n is left to TE implementation |  |
| daps-Config-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |
| securityConfig | Not present |  |  |
| } |  |  |  |

Table 7.3.1.4.4.3-7: CellGroupConfig (Table 7.3.1.4.4.3-6)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell\_change | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| rlc-BearerToAddModList | Not present |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| reconfigurationWithSync SEQUENCE { |  |  |  |
| spCellConfigCommon SEQUENCE { |  |  |  |
| physCellId | PhysCellId for Cell 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.1.4.4.3-8: RRCReconfiguration (Step 12)

|  |
| --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS\_HO\_ReleaseSource |

7.3.1.4.5 Test requirements

Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.4.5-1: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 1 in FR1)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | |
|  | | |  | T1 | T2 | T3 | T4 | T5 |
| NR RF Channel Number | | |  | 1 | | | | |
| Duplex mode | | Config 1 |  | FDD | | | | |
|  | | Config 2,3 |  | TDD | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | |
|  | | Config 2 |  | SR.1.1 TDD | | | | |
|  | | Config 3 |  | SR2.1 TDD | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | | |
|  | | Config 3 |  | CR2.1 TDD | | | | |
| OCNG Patterns | | |  | OP.1 | | | | |
| CSI-RS configuration | | Config 1 |  | CSI-RS.1.1 FDD | | | | |
| for CSI reporting | | Config 2 |  | CSI-RS.1.1 TDD | | | | |
|  | | Config 3 |  | CSI-RS.2.1 TDD | | | | |
| reportConfigType | | |  | periodic | | | | |
| reportQuantity | | |  | cri-RI-PMI-CQI | | | | |
| CSI reporting | | Config 1,2 | slot | 5 | | | | |
| periodicity | | Config 3 |  | 10 | | | | |
| CSI reporting offset | | Config 1,2 | slot | 3 | | | | |
|  | | Config 3 |  | 5 | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | |
|  | | Config 3 |  | SSB.2 FR1 | | | | |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 | | | | |
|  | | Config 3 |  | SMTC.2 | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | |
| Config 3 | 30 kHz | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | |
| Config 3 | 30 kHz | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 2 | | | | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.3 | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.3 | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | | |
| Note2 | | | dBm/15kHz | NA  Link only, see clause A.3.7A | | | | |
| Note2 | Config 1,2 | | dBm/SCS |  | | | | |
|  | Config 3 | |  |  | | | | |
|  | | | dB |  | | | | |
|  | | | dB |  | | | | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz |  | | | | |
|  | Config 3 | | dBm/  38.16MHz |  | | | | |
| 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.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

Table 7.3.1.4.5-2: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 2 in FR2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | |
|  | |  | T1 | T2 - T5 |
| Assumption for UE beamsNote 6 | |  | Rough | |
| AoA setup | |  | Setup 1 as defined in A.9 | |
| NR RF Channel Number | |  | 2 | |
| Duplex mode | Config 1,2,3 |  | TDD | |
| TDD configuration | Config 1,2,3 |  | TDDConf.3.1 | |
| BWchannel | Config 1,2,3 | MHz | 100: NRB,c = 66 | |
| BWP BW | Config 1,2,3 | MHz | 100: NRB,c = 66 | |
| TRS configuration | Config 1,2,3 |  | TRS.2.1 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 |  | SR3.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 |  | CR3.1 TDD | |
| OCNG Patterns | |  | OCNG pattern 1 | |
| SSB Configuration | Config 1,2,3 |  | SSB.1 FR2 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 |  | CSI-RS.3.1 TDD | |
| SMTC Configuration | |  | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PRACH configuration | |  | FR2 PRACH configuration 2 | |
| TCI configuration | |  | CSI-RS.Config.0 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -104.7 | -104.7 |
| Note2 | | dBm/SCS | -95.7 | -95.7 |
|  | | dB | -Infinity | 10 |
|  | | dB | -Infinity | 10 |
| IoNote3 | | dBm/  95.04MHz | -66.7 | -55.4 |
| 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.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation. | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than Dhandover1 from the beginning of time period T3. The interruption on Cell 1 shall not exceed Tinterrupt1 as defined in TS 38.133 [6] Table 6.1.3.4.2-1 for synchronous DAPS HO. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

Dhandover1= TRRC\_procedure + Tsearch + TIU + Tprocessing + T∆ + Tmargin

- TRRC\_procedure= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- Tsearch = 0 ms for known target cell, is the the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;

TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.

- Tprocessing = 40 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

- T∆ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.

- Tmargin = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 92 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from Cell 1 and Cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release Cell 1 less than Dhandover2 from the beginning of time period T4, where:

Dhandover2= TRRC\_procedure + Tinterrupt2

- TRRC\_procedure= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- Tinterrupt2 = 1.125 ms for sync intra-frequency DAPS handover, is the allowed interruption length during Dhandover2 as in 38.133 [13] clause 6.1.1.2.2;

This gives a total of 11.125 ms.

UE shall not report CSI to Cell 1 during T5.

#### 7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover

Editor's Note:

* This test case is incomplete since FR1-FR2 OTA testability is still FFS.
* MU and TT analysis is complete for UE PC3 and test frequency f ≤ 40.8 GHz.
* MU and TT analysis is incomplete for test frequency f > 40.8 GHz
* MU and TT analysis is incomplete for UE power class other than PC3.
* Connection diagram may require updates for FR1+FR2 scenarios

7.3.1.5.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency asynchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

7.3.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting inter-frequency asynchronous DAPS handover and supporting different SCSs in source PCell and inter-frequency target PCell in DAPS handover.

7.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.5.

7.3.1.5.4 Test description

7.3.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.5.4.1-1.

Table 7.3.1.5.4.1-1: NR SA FR1-FR2 asynchronous DAPS handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 7.3.1.5-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.5-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.5-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 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 7.3.1.5.4.1-2

Table 7.3.1.5.4.1-2: Initial conditions for NR SA FR1-FR2 asynchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | [A.3.3.3.1-1] | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.1.5.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.5.4.1-3 below, with A4-Threshold modified by Test Tolerance.

Table 7.3.1.5.4.1-3: General test parameters for NR SA FR1-FR2 asynchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A4-Threshold | | dBm | -120 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | μs | 62.5 | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO. |
| T5 | | ms | 100 |  |

7.3.1.5.4.2 Test procedure

Same test procedure as described in clause 7.3.1.4.4.2.

7.3.1.5.4.3 Message contents

Same message contents as described in clause 7.3.1.4.4.3.

7.3.1.5.5 Test requirements

Table 7.3.1.5.5-1 and Table 7.3.1.5.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.5.5-1: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 1 in FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | |
|  | | |  | T1 | T2 - T5 |
| NR RF Channel Number | | |  | 1 | |
| Duplex mode | | Config 1 |  | FDD | |
|  | | Config 2,3 |  | TDD | |
| TDD configuration | | Config 1 |  | Not Applicable | |
|  | | Config 2 |  | TDDConf.1.1 | |
|  | | Config 3 |  | TDDConf.2.1 | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | |
|  | | Config 2 |  | TRS.1.1 TDD | |
|  | | Config 3 |  | TRS.1.2 TDD | |
| DRX Cycle | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | |
|  | | Config 2 |  | SR.1.1 TDD | |
|  | | Config 3 |  | SR.2.1 TDD | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | |
|  | | Config 2 |  | CR.1.1 TDD | |
|  | | Config 3 |  | CR.2.1 TDD | |
| OCNG Patterns | | |  | OP.1 | |
| CSI-RS configuration | | Config 1 |  | CSI-RS.1.1 FDD | |
| for CSI reporting | | Config 2 |  | CSI-RS.1.1 TDD | |
|  | | Config 3 |  | CSI-RS.2.1 TDD | |
| reportConfigType | | |  | periodic | |
| reportQuantity | | |  | cri-RI-PMI-CQI | |
| CSI reporting | | Config 1,2 | slot | 5 | |
| periodicity | | Config 3 |  | 10 | |
| CSI reporting offset | | Config 1,2 | slot | 3 | |
|  | | Config 3 |  | 5 | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.2 FR1 | |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 | |
|  | | Config 3 |  | SMTC.2 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
|  | | Config 3 |  | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
|  | | Config 3 |  | 30 kHz | |
| PRACH configuration | | |  | FR1 PRACH configuration 2 | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | |
|  | | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | | Initial UL BWP |  | ULBWP.0.1 | |
|  | | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |  |  | |
| Note2 | | | dBm/15kHz | NA  Link only, see clause A.3.7A | |
| Note2 | Config 1,2 | | dBm/SCS |  | |
|  | Config 3 | |  |  | |
|  | | | dB |  | |
|  | | | dB |  | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz |  | |
|  | Config 3 | | dBm/  38.16MHz |  | |
| 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.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table 7.3.1.5.5-2: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 2 in FR2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | | |
|  | |  | T1 | | T2 - T5 | |
| Assumption for UE beamsNote 6 | |  | Rough | | | |
| AoA setup | |  | Setup 1 as defined in A.9 | | | |
| NR RF Channel Number | |  | 2 | | | |
| Duplex mode | Config 1,2,3 |  | TDD | | | |
| TDD configuration | Config 1,2,3 |  | TDDConf.3.1 | | | |
| BWchannel | Config 1,2,3 | MHz | 100: NRB,c = 66 | | | |
| BWP BW | Config 1,2,3 | MHz | 100: NRB,c = 66 | | | |
| TRS configuration | Config 1,2,3 |  | TRS.2.1 TDD | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1,2,3 |  | SR.3.1 TDD | | | |
| CORESET Reference Channel | Config 1,2,3 |  | CR.3.1 TDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 |  | | CSI-RS.3.1 TDD | | |
| SSB Configuration | Config 1,2,3 |  | SSB.1 FR2 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | | | |
| PRACH configuration | |  | FR2 PRACH configuration 2 | | | |
| TCI configuration | |  | CSI-RS.Config.0 | | | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | | | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDSCH to PDSCH | |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  | | | |
| Note2 | | dBm/15kHz | | -104.7 | | -104.7 |
| Note2 | | dBm/SCS | | -95.7 | | -95.7 |
|  | | dB | | -Infinity | | 10 |
|  | | dB | | -Infinity | | 10 |
| IoNote3 | | dBm/  95.04MHz | | -66.7 | | -55.4 |
| 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.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | |

Same Test requirements as described in clause 7.3.1.4.5.

### 7.3.2 RRC connection mobility control

#### 7.3.2.1 RRC re-establishment

##### 7.3.2.1.0 Minimum conformance requirements

In RRC\_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within Tre-establish\_delay seconds from the moment it detects a loss in RRC connection. The total RRC connection delay (Tre-establish\_delay) shall be less than:

Tre-establish\_delay = TUE\_re-establish\_delay + TUL\_grant

TUL\_grant: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay (TUE\_re-establish\_delay) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay (TUE\_re-establish\_delay) requirement shall be less than:

TUE\_re-establish\_delay = 50ms + Tidentify\_intra\_NR + + TSI-NR + TPRACH

The intra-frequency target NR cell shall be considered detectable when for each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in Section 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,

- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Section 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,

- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

Tidentify\_intra\_NR: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then Tidentify\_intra\_NR=0; otherwise Tidentify\_intra\_NR shall not exceed the values defined in table 6.2.1.2.1-1.

Tidentify\_inter\_NR,i: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. Tidentify\_inter\_NR,i shall not exceed the values defined in table 6.2.1.2.1-2.

TSMTC: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2*, Tsmtc follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

TSMTC,i: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

TSI-NR = It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

TPRACH = It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. TPRACH can be 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 [3].

Nfreq: It is the total number of NR frequencies to be monitored for RRC re-establishment; Nfreq = 1 if the target intra-frequency NR cell is known, else Nfreq = 2 and Tidentify\_intra\_NR = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

Table 6.2.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

|  |  |  |  |
| --- | --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | Tidentify\_intra\_NR (ms) | |
| Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x TSMTC) | MAX (800 ms, 10 x TSMTC) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 80 x TSMTC)) |
| < -8 | FR1 | N/A | 800Note1 |
| < -8 | FR2 | N/A | 3520Note1 |
| Note 1: The UE is not required to successfullyidentify a cell on any NR frequency layer when TSMTC > 20 ms and serving cell SSB Ês/Iot < [-8] dB. | | | |

Table 6.2.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

|  |  |  |  |
| --- | --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | Tidentify\_inter\_NR, i (ms) | |
| Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x TSMTC, i) | MAX (800 ms, 13 x TSMTC, i) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 104 x TSMTC, i)) |
| < -8 | FR1 | N/A | 800Note1 |
| < -8 | FR2 | N/A | 4000Note1 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when TSMTC,i > 20 ms and serving cell SSB Ês/Iot < -8 dB. | | | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1.

##### 7.3.2.1.1 NR SA FR2 RRC re-establishment

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.1.1.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

7.3.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.1

7.3.2.1.1.4 Test description

7.3.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.1.4.1-2. Test environment parameters are given in Table 7.3.2.1.1.4.1-3.

Table 7.3.2.1.1.4.1-1: Intra-frequency RRC re-establishment in FR2 supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

Table 7.3.2.1.1.4.1-2: General test parameters for Intra-frequency RRC re-establishment in FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| Neighbour cells |  | 1 | Cell2 |  |
| Final condition | Active cell |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1 |  |
| Time offset between cells | |  | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| SMTC configuration | |  | 1 | SMTC.1 |  |
| DRX cycle length | | s | 1 | OFF |  |
| PRACH configuration | |  | 1 | PRACH.1 FR2 | As specified in Annex A.7 |
| T1 | | s | 1 | 5 |  |
| T2 | | s | 1 | 4.84 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3 | | s | 1 | 5 |  |

Table 7.3.2.1.1.4.1-3: Test Environment Intra-frequency RRC re-establishment in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5.1 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 7.3.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.3.2.1.1.4.3.

2. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

3. The AoA setup for this test is Setup 1 as defined in clause A.9

7.3.2.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in RRC\_CONNECTED state with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.3.2.1.1.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.1.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.1.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.1.4.3 Message contents

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

Table 7.3.2.1.1.4.3-1: Common Exception messages for NR intra-frequency RRC re-establishment test case in FR2

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

Table 7.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| t311 | ms5000 |  |  |
| } |  |  |  |

Table 7.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { |  |  |  |
| reportConfigToAddModList | Not present |  |  |
| measIdToAddModList | Not present |  |  |
| quantityConfig | Not present |  |  |
| } |  |  |  |

7.3.2.1.1.5 Test requirement

Table 7.3.2.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Assumption for UE beamsNote 4 |  |  | Rough | | | Rough | | |
| TDD configuration |  | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1 | 66 | | | 66 | | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration |  | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern |  | 1 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
| AoA setup |  | 1 | Setup 1 | | | Setup 1 | | |
|  | dB | 1 | -0.12 | -infinity | -infinity | -3.46 | 2 | 2 |
| Note2 | dBm/SCS | 1 | -104.7 | | | | | |
| Note2 | dBm/15 kHz | 1 | -95.7 | | | | | |
|  | dB | 1 | 4 | -infinity | -infinity | 2 | 2 | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -91.7 | -infinity | -infinity | -93.7 | -93.7 | -93.7 |
| Io | dBm/95.04 MHz | 1 | -59.64 | -62.59 | -62.59 | -59.94 | -62.59 | -62.59 |
| Propagation Condition |  | 1 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 in Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

##### 7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.1.2.1 Test purpose

The purpose of this test is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

7.3.2.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.2

7.3.2.1.2.4 Test description

7.3.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.2.4.1-2. Test environment parameters are given in Table 7.3.2.1.2.4.1-3.

Table 7.3.2.1.2.4.1-1: Inter-frequency RRC re-establishment in FR2 supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

Table 7.3.2.1.2.4.1-2: General test parameters for Inter-frequency RRC re-establishment in FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| Neighbour cells |  | 1 | Cell2 |  |
| Final condition | Active cell |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| SMTC configuration | |  | 1 | SMTC.1 |  |
| DRX cycle length | | s | 1 | OFF |  |
| PRACH configuration | |  | 1 | PRACH.1 FR2 | As specified in Annex A.7 |
| T1 | | s | 1 | 5 |  |
| T2 | | s | 1 | 4.84 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) |
| T3 | | s | 1 | 6 |  |

Table 7.3.2.1.2.4.1-3: Test Environment Inter-frequency RRC re-establishment in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| 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 FFS 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 7.3.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.3.2.1.2.4.3

2. There are two cells on two NR carriers specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

3. The AoA setup for this test is Setup 1 as defined in clause A.9

7.3.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

1. Ensure the UE is in RRC\_CONNECTED state with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.3.2.1.2.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 6 seconds from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.2.4.3 Message contents

Same message content as in 7.3.2.1.1.4.3. Table 7.3.2.1.2.4.3-1: Void

Table 7.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| t311 | ms5000 |  |  |
| } |  |  |  |

Table 7.3.2.1.2.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { |  |  |  |
| reportConfigToAddModList | Not present |  |  |
| measIdToAddModList | Not present |  |  |
| quantityConfig | Not present |  |  |
| } |  |  |  |

7.3.2.1.2.5 Test requirement

Table 7.3.2.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.2.1.2.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beamsNote 4 |  |  | Rough | | | Rough | | |
| AoA setup |  | 1 | Setup 3 | | | | | |
| AoA1 | | | AoA2 | | |
| TDD configuration |  | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration |  | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern |  | 1 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
|  | dB | 1 | 5+TT | -infinity | -infinity | -infinity | -infinity | 8+TT |
| Note2 | dBm/SCS | 1 | -98+TT | | | | | |
| Note2 | dBm/15 kHz | 1 | -89+TT | | | | | |
|  | dB | 1 | 5+TT | -infinity | -infinity | -infinity | -infinity | 8+TT |
| SS-RSRP Note3 | dBm/SCS | 1 | -84+TT | -infinity | -infinity | -infinity | -infinity | -81+TT |
| Io | dBm/95.04 MHz | 1 | -53.82+TT | -infinity | -infinity | -infinity | -infinity | -51.37+TT |
| Propagation Condition |  | 1 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

##### 7.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test tolerances and test system uncertainties applicable to this test are undefined.

- Antenna diagram is TBD

- Message content is TBD

7.3.2.1.3.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits, and to verify the requirements in TS 38.133 [6] clause 6.2.1

7.3.2.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.3

7.3.2.1.3.4 Test description

7.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 7.3.2.1.3.4.1-1.

Table 7.3.2.1.3.4.1-1: Supported test configurations for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

Configure the test requirement and the DUT according to the parameters in Table 7.3.2.1.3.4.1-2.

Table 7.3.2.1.3.4.1-2: Initial conditions for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5.1 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 7.3.2.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | FFS |
| Exceptions to connection diagram |  | |  |

1. The general test parameter settings are set up according to Table 7.3.2.1.3.4.1-3.

2. Message contents are defined in clause 7.3.2.1.3.4.3.

There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.3.2.1.3.4.1-3: General test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| Neighbour cells |  | 1 | Cell2 |  |
| Final condition | Active cell |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1 |  |
| Time offset between cells | |  | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| SMTC configuration | |  | 1 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1 | OFF |  |
| PRACH configuration index | |  | 1 | PRACH.1 FR2 |  |
| T1 | | s | 1 | 5 |  |
| T2 | | s | 1 | 10.84 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | | s | 1 | 5 |  |

7.3.2.1.3.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.3.2.1.3.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.3.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.3.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 5 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.3.4.3 Message contents

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

Table 7.3.2.1.3.4.3-1: Common Exception messages for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

7.3.2.1.3.5 Test requirement

Table 7.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR2 - FR2 RRC re-establishment without serving cell timing tests.

Table 7.3.2.1.3.5-1: Cell specific test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beamsNote 4 |  |  | Rough | | | Rough | | |
| TDD configuration |  | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration |  | 1 | TRS.2.1 TDD | | | N/A | | |
| TCI state |  | 1 | CSI-RS.Config.0 | | | N/A | | |
| OCNG Pattern |  | 1 | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
| AoA setup |  | 1 | Setup 1 defined in A. 9 | | | Setup 1 defined in A.9 | | |
|  | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
| Note2 | dBm/15 kHz | 1 | -89 | | | | | |
|  | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -93 | -infinity | -infinity | -infinity | -infinity | -93 |
| Io | dBm/95.04 MHz | 1 | -62.82 | -infinity | -infinity | -infinity | -infinity | -62.82 |
| Propagation Condition |  | 1 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE\_re-establish\_delay.

Where:

TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

Nfreq = 1

Tidentify\_intra\_NR = 3520 ms

TSI = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

#### 7.3.2.2 Random access

##### 7.3.2.2.0 Minimum conformance requirements

7.3.2.2.0.1 Minimum conformance requirements for Contention based random access

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 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

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 send ACK if the Contention Resolution is successful.

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 unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

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] clause 6.2.2.

7.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

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 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

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

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

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.

##### 7.3.2.2.1 NR SA FR2 contention based random access

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for PRACH timing are in [ ]

- The results of the TT analysis are provisional until the corresponding MU values are agreed

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.1.1 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.

7.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.1.

7.3.2.2.1.4 Test description

7.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.1.4.1-1.

Table 7.3.2.2.1.4.1-1: Contention based random access test in FR2 for NR standalone supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 7.3.2.2.1-1 | 1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of ΔDL and ΔUL according to the following principles:

With the UE configured to report SS-RSRP, the ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP\_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.1.4.1-2.

Table 7.3.2.2.1.4.1-2: Test Environment for Contention based random access test in FR2 for NR standalone

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.1.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | FFS |
| Exceptions to connection diagram | FFS | |  |

1. Message contents are defined in clause 7.3.2.2.1.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.1.5-1 and 7.3.2.2.1.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

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 2 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 3 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 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

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 2 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 3 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 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

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.

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.

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

8. Test 5: Correct behaviour when receiving an unsuccessful 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.

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, 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.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

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.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

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

10.1. Repeat steps 1-3.

10.2. 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.

10.3. 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.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, 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.

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

7.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
| Information Element | Value/remark | Comment | Condition |
| FrequencyInfoUL-SIB SEQUENCE { |  |  |  |
| p-Max | 23 | 23 dBm |  |
| } |  |  |  |

Table 7.3.2.2.1.4.3-2: 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 |  | FR2 |
| } |  |  |  |
| groupBconfigured SEQUENCE { |  |  |  |
| numberOfRA-PreamblesGroupA | 48 |  |  |
| } |  |  |  |
| ra-ContentionResolutionTimer | sf48 |  |  |
| rsrp-ThresholdSSB | RSRP\_69 +ΔDL | ΔDL is derived from the downlink calibration process |  |
| prach-RootSequenceIndex CHOICE { |  |  |  |
| 0 |  |  |  |
| } |  |  |  |
| msg1-SubcarrierSpacing | kHz 120 |  |  |
|  |  |  |  |
| } |  |  |  |

Table 7.3.2.2.1.4.3-3: 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 | 190 |  | FR2 |
| msg1-FDM | one |  | FR2 |
| zeroCorrelationZoneConfig | 11 |  |  |
| preambleReceivedTargetPower | -100 |  |  |
| preambleTransMax | n6 |  |  |
| powerRampingStep | dB2 |  |  |
| ra-ResponseWindow | sl10 |  |  |
| } |  |  |  |

Table 7.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| ssb-PositionsInBurst SEQUENCE { |  |  |  |
| inOneGroup | ‘1100 0000’B |  |  |
| } |  |  |  |
| ss-PBCH-BlockPower | 20 +ΔUL | ΔUL is derived from the uplink calibration process |  |
| } |  |  |  |

7.3.2.2.1.5 Test requirement

Table 7.3.2.2.1.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.1.5-3, 7.3.2.2.1.5-4 and 7.3.2.2.1.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.1.5-1: General test parameters for contention based random access test in FR2 for NR Standalone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Comments |
| SSB Configuration | Config 1 |  | SSB.1 FR2 | As defined in A.3.2 |
| Duplex Mode for Cell 1 | Config 1 |  | TDD |  |
| TDD Configuration | Config 1 |  | TDDConf.3.1 | As defined in A.1.5 |
| BWchannel | Config 1 | MHz | 100: NRB,c = 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | As defined in A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1 |  | SR.3.1 TDD | As defined in A.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD | As defined in A.1.2 |
| 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 |
| *ss-PBCH-BlockPower* | | dBm/ SCS | +20 +ΔUL | As defined in TS 38.331 [13].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 of TS 38.101-2 [3] |
| PRACH Configuration | |  | PRACH.1 FR2 | As defined in A.7.2, with exceptions as defined below |
| *rsrp-ThresholdSSB* | | dBm | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | | dBm | -100 | As defined in TS 38.331 [13] |
| Note 1: OCNG shall be used such that 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: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | |

Table 7.3.2.2.1.5-2: OTA-related test parameters for contention based random access test in FR2 for NR Standalone

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test-1 | Comments |
| AoA setup | | |  | Setup 1 | As defined in A.9.1 |
| Assumption for UE beamsNote 2 | | |  | Rough |  |
| SSB with index 0 | Es Note1 | | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | | dBm/SCS | -80.6 |
| Es/IotBB | | dB | 21.09 |  |
| Io | | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 |
| Es/IotBB | dB | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | | - | AWGN |  |
| Note 1: No artificial noise is applied in this test.  Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

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 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

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 an incorrect message over Temporary C-RNTI

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

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

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 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Table 7.3.2.2.1.5-3: Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± FFS dB |

Table 7.3.2.2.1.5-4: Relative power tolerance Test requirements

|  |  |  |
| --- | --- | --- |
| Measured power | Power step P (dB) | PRACH (dB) |
| Measured power of both PRACHs being compared > (PmaxNote1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either PRACHs being compared ≤ (PmaxNote1 – 6dB) | ± (6+FFS) |
| Note 1: Pmax is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

Table 7.3.2.2.1.5-5: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(KHz) | Te |
| 2 | 120 | 120 | 224+[48]\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

##### 7.3.2.2.2 NR SA FR2 non-contention based random access

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for PRACH timing are in [ ]

- The results of the TT analysis are provisional until the corresponding MU values are agreed

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.2.1 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.

7.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble.

7.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.2.

7.3.2.2.2.4 Test description

7.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.2.4.1-1.

Table 7.3.2.2.2.4.1-1: Non-Contention based random access test in FR2 for NR standalone supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 7.3.2.2.2-1 | 1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of ΔDL and ΔUL according to the following principles:

With the UE configured to report SS-RSRP, the ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP\_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.2.4.1-2.

Table 7.3.2.2.2.4.1-2: Test Environment for Non-Contention based random access test in FR2 for NR standalone

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.2.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | FFS |
| Exceptions to connection diagram | FFS | |  |

1. Message contents are defined in clause 7.3.2.2.2.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. 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 *NR*, 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 7.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure.

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 7.3.2.2.2.5-1 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 2 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 3 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 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

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 2 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 3 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 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

7.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
| Information Element | Value/remark | Comment | Condition |
| FrequencyInfoUL-SIB SEQUENCE { |  |  |  |
| p-Max | 23 | 23 dBm |  |
| } |  |  |  |

Table 7.3.2.2.2.4.3-2: 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 |  |  |
| } |  |  |  |
| ra-ContentionResolutionTimer | Not present |  |  |
| rsrp-ThresholdSSB | RSRP\_69 +ΔDL | ΔDL is derived from the downlink calibration process | Subtest 1 |
| prach-RootSequenceIndex CHOICE { |  |  |  |
| 0 |  |  |  |
| } |  |  |  |
| msg1-SubcarrierSpacing | kHz 120 |  |  |
|  |  |  |  |
| } |  |  |  |

Table 7.3.2.2.2.4.3-3: 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 { | 2 entries |  |  |
| ssb[1] | 0 |  |  |
| ssb[2] | 1 |  |  |
| 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\_69 +ΔDL | ΔDL is derived from the downlink calibration process | Subtest 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.2.2.2.4.3-4: 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 | 190 |  | FR2 |
| msg1-FDM | one |  | FR2 |
| zeroCorrelationZoneConfig | 11 |  |  |
| preambleReceivedTargetPower | -100 |  |  |
| preambleTransMax | n6 |  |  |
| powerRampingStep | dB2 |  |  |
| ra-ResponseWindow | sl10 |  |  |
| } |  |  |  |

Table 7.3.2.2.2.4.3-5: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| ssb-PositionsInBurst SEQUENCE { |  |  |  |
| inOneGroup | ‘1100 0000’B |  |  |
| } |  |  |  |
| ss-PBCH-BlockPower | 20 +ΔUL | ΔUL is derived from the uplink calibration process |  |
| } |  |  |  |

7.3.2.2.2.5 Test requirement

Table 7.3.2.2.2.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.2.5-3, 7.3.2.2.2.5-4 and 7.3.2.2.2.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR2 for NR Standalone

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Test-2 | Comments |
| SSB Configuration | Config 1 |  | SSB.1 FR2 | SSB.1 FR2 | As defined in A.3.2 |
| CSI-RS Configuration | Config 1 |  | N/A | CSI-RS.3.1 TDD | As defined in A.1.4 |
| Duplex Mode for Cell 2 | Config 1 |  | TDD | TDD |  |
| TDD Configuration | Config 1 |  | TDDConf.3.1 | TDDConf.3.1 | As defined in A.1.5 |
| BWchannel | Config 1 | MHz | 100: NRB,c = 24 | 100: NRB,c = 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | OP.3 | As defined in A.2.1. |
| PDSCH Reference Channel Note 2 | Config 1 |  | SR3.1 TDD | SR3.1 TDD | As defined in A.1.1. |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD | CR.3.1 TDD | As defined in A.1.2 |
| NR RF Channel Number | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH\_DMRS | | dB |
| EPRE ratio of PDCCH\_DMRS to SSS | | dB |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | dB |
| EPRE ratio of PDSCH\_DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | dB |
| ss-PBCH-BlockPower | | dBm/ SCS | +20 +ΔUL | +20 +ΔUL | As defined in TS 38.331 [13].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| PRACH Configuration | |  | PRACH.2 FR2 | PRACH.3 FR2 | As defined in A.7.2, with exceptions as defined below. |
| rsrp-ThresholdSSB | | dBm | RSRP\_69 +ΔDL | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| preambleReceivedTargetPower | | dBm | -100 | -100 | As defined in TS 38.331 [13] |
| Note 1: OCNG shall be used such that 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: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | | |

Table 7.3.2.2.2.5-2: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Test-2 | Comments |
| AoA setup | |  | Setup 1 | Setup 1 | As defined in A.9.1 |
| Assumption for UE beamsNote 2 | |  | Rough | Rough |  |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -80.6 | -80.6 |
| Es/IotBB | dB | 21.09 | 21.09 |  |
| Io | dBm/95.04 MHz | -56.01 | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 | -95.0 |
| Es/IotBB | dB | 6.69 | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | AWGN | AWGN |  |
| Note 1: No artificial noise is applied in this test.  Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

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 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Table 7.3.2.2.2.5-3: Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± FFS dB |

Table 7.3.2.2.2.5-4: Relative power tolerance Test requirements

|  |  |  |
| --- | --- | --- |
| Measured power | Power step P (dB) | PRACH (dB) |
| Measured power of both PRACHs being compared > (PmaxNote1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either PRACHs being compared ≤ (PmaxNote1 – 6dB) | ± (6+FFS) |
| Note 1: Pmax is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

Table 7.3.2.2.2.5-5: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(KHz) | Te |
| 2 | 120 | 120 | 224+[48]\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

##### 7.3.2.2.3 NR SA FR2 2-step contention based random access

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for Te Timing error are in [ ]

- TT analysis is missing

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.3.1 Test purpose

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

7.3.2.2.3.2 Test applicability

This test applies to all types of NR UE supporting 2-step RA type from Release 16 onwards.

7.3.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.3.

7.3.2.2.3.4 Test description

7.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.3.4.1-1.

Table 7.3.2.2.3.4.1-1: 2-step contention based random access test in FR2 for NR standalone supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 7.3.2.2.3-1 | 1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of ΔDL and ΔUL according to the following principles:

With the UE configured to report SS-RSRP, the ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP\_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.3.4.1-2.

Table 7.3.2.2.3.4.1-2: Test Environment for 2-step RACH contention based random access test in FR2 for NR standalone

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.3.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | FFS |
| Exceptions to connection diagram | FFS | |  |

1. Message contents are defined in clause 7.3.2.2.3.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.3.5-1 and 7.3.2.2.3.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA

4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

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 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

5.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB’s contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble of MsgA.

5.4 The System Simulator shall transmit a MsgB containing fallbackRAR message with a Random Access Preamble identifier matching the transmitted MsgA PRACH after 3 MsgA transmissions have been received by the System Simulator.

5.5 As the received Random Access Response MsgB with a fallbackRAR contains Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

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 2 preambles.

6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

7.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.3.4.3-1: *FrequencyInfoUL-SIB* for 2-step contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
| Information Element | Value/remark | Comment | Condition |
| FrequencyInfoUL-SIB SEQUENCE { |  |  |  |
| p-Max | 23 | 23 dBm |  |
| } |  |  |  |

Table 7.3.2.2.3.4.3-2: RACH-ConfigCommon for 2-step contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-128A | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { |  |  |  |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA |  |  |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 |  |  |
| msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB-r16 CHOICE { | oneFourth, n48 |  |  |
| one | n4 |  | FR2 |
| } |  |  |  |
| msgA-CB-PreamblesPerSSB-PerSharedRO-r16 | oneFourth, n48 |  |  |
| msgA-SSB-SharedRO-MaskIndex-r16 | Not present |  |  |
| groupB-ConfiguredTwoStepRA-r16 | Not present |  |  |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | Not present |  |  |
| msgA-TransMax-r16 | N8 |  |  |
| msgA-RSRP-Threshold-r16 | RSRP\_69 +ΔDL |  |  |
| msgA-RSRP-ThresholdSSB-r16 | RSRP\_69 +ΔDL |  |  |
| msgA-SubcarrierSpacing-r16 | 120 kHz |  |  |
| msgA-RestrictedSetConfig-r16 | Not present |  |  |
| ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE { |  |  |  |
| ra-Prioritization-r16 | RA-Prioritization |  |  |
| ra-PrioritizationForAI-r16 | '10'B |  |  |
| } |  |  |  |
| ra-ContentionResolutionTimer-r16 | sf32 |  |  |
| } |  |  |  |

Table 7.3.2.2.3.4.3-3: RACH-ConfigGeneric for 2-step contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-130A | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { |  |  |  |
| msgA-PRACH-ConfigurationIndex-r16 | 190 |  |  |
| msgA-RO-FDM-r16 | four |  |  |
| msgA-RO-FrequencyStart-r16 | 0 |  |  |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 |  |  |
| msgA-PreamblePowerRampingStep-r16 | dB2 |  |  |
| msgA-PreambleReceivedTargetPower-r16 | -100 |  |  |
| msgB-ResponseWindow-r16 | sl10 |  |  |
| preambleTransMax-r16 | n10 |  |  |
| } |  |  |  |

Table 7.3.2.2.3.4.3-4: *ServingCellConfigCommonSIB* for 2-step contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| ssb-PositionsInBurst SEQUENCE { |  |  |  |
| inOneGroup | ‘1100 0000’B |  |  |
| } |  |  |  |
| ss-PBCH-BlockPower | 20 +ΔUL | ΔUL is derived from the uplink calibration process |  |
| } |  |  |  |

Table 7.3.2.2.3.4.3-5: MsgA-PUSCH-Config for 2-step contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-81B | | | |
| Information Element | Value/remark | Comment | Condition |
| MsgA-PUSCH-Resource-r16 ::= SEQUENCE { |  |  |  |
| msgA-MCS | 1 |  |  |
| nrofSlotsMsgA-PUSCH | 1 |  |  |
| nrofMsgA-PO-PerSlot | 1 |  |  |
| msgA-PUSCH-TimeDomainOffset | 1 |  |  |
| msgA-PUSCH-TimeDomainAllocation-r16 | 3 | Equivalent to PUSCH start symbol = 0 and allocation length = 10 |  |
| mappingTypeMsgA-PUSCH | typeA |  |  |
| nrofPRBs-PerMsgA-PO | 2 |  |  |
| nrofMsgA-PO-FDM | One |  |  |
| msgA-DMRS-AdditionalPosition | pos1 |  |  |
| msgA-PUSCH-NrofPorts | 1 |  |  |
| msgA-DeltaPreamble | 3 |  |  |
| msgA-Alpha | alpha1 |  |  |
| deltaMCS | Disabled |  |  |
| } |  |  |  |

7.3.2.2.3.5 Test requirement

Table 7.3.2.2.3.5-2 defines the primary level settings for 2-step contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.3.5-3, 7.3.2.2.3.5-4 and 7.3.2.2.3.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.3.5-1: General test parameters for 2-step contention based random access test in FR2 for NR Standalone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Comments |
| SSB Configuration | Config 1 |  | SSB.1 FR2 | As defined in A.3.2 |
| Duplex Mode for Cell 1 | Config 1 |  | TDD |  |
| TDD Configuration | Config 1 |  | TDDConf.3.1 | As defined in A.1.5 |
| BWchannel | Config 1 | MHz | 100: NRB,c = 24 |  |
| OCNG Pattern Note 1 | |  | OCNG pattern 1 | As defined in A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1 |  | SR.3.1 TDD | As defined in A.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD | As defined in A.1.2 |
| NR RF Channel Number | |  | 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 |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | dB |  |  |
| ss-PBCH-BlockPower | | dBm/ SCS | +20 +ΔUL | As defined in TS 38.331 [13].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| MsgA Configuration | |  | FR2 MsgA configuration 1 | As defined in A.7.2, with exceptions as defined below |
| *msgA-RSRP-ThresholdSSB* | | dBm | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| preambleReceivedTargetPower | | dBm | -100 | As defined in TS 38.331 [13] |
| Note 1: OCNG shall be used such that 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: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | |

Table 7.3.2.2.3.5-2: OTA-related test parameters for 2-step contention based random access test in FR2 for NR Standalone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Comments |
| AoA setup | |  | Setup 2b | As defined in A.9.2.2 |
| Assumption for UE beamsNote 2 | |  | Rough |  |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -80.6 |
| Es/IotBB | dB | 21.09 |  |
| Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 |
| Es/IotBB | dB | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | AWGN |  |
| Note 1: No artificial noise is applied in this test.  Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

Test 1: Correct behaviour when transmitting MsgA

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

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Table 7.3.2.2.3.5-3: Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± FFS dB |

Table 7.3.2.2.3.5-4: Relative power tolerance Test requirements

|  |  |  |
| --- | --- | --- |
| Measured power | Power step P (dB) | MsgA (dB) |
| Measured power of both MsgAs being compared > (PmaxNote1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either MsgAs being compared ≤ (PmaxNote1 – 6dB) | ± (6+FFS) |
| Note 1: Pmax is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

Table 7.3.2.2.3.5-5: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(KHz) | Te |
| 2 | 120 | 120 | 224+[48]\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

##### 7.3.2.2.4 NR SA FR2 2-step non-contention based random access

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for Te Timing error are in [ ]

- TT analysis is missing

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.4.1 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 MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

7.3.2.2.4.2 Test applicability

This test applies to all types of NR SA FR2 UE from Release 16 onwards.

7.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.7.3.2.2.4.

7.3.2.2.4.4 Test description

7.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.4.4.1-1.

Table 7.3.2.2.4.4.1-1: 2-step non-contention based random access test in FR2 for NR standalone supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 7.3.2.2.4-1 | 1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of ΔDL and ΔUL according to the following principles:

With the UE configured to report SS-RSRP, the ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP\_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.4.4.1-2.

Table 7.3.2.2.4.4.1-2: Test Environment for 2-step RACH non-dsscontention based random access test in FR2 for NR standalone

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.4.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | FFS |
| Exceptions to connection diagram | FFS | |  |

1. Message contents are defined in clause 7.3.2.2.4.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.4.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.3.2.2.4.5-1 and 7.3.2.2.4.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

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 2 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 containing fallbackRAR with a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 MsgA transmissions 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 may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in clause 7.3.2.2.4.5.

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 2 preambles.

6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window in RACH-ConfigGenericTwoStepRA.

6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.4.5.

7.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.4.4.3-1: *FrequencyInfoUL-SIB* for 2-step non-contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
| Information Element | Value/remark | Comment | Condition |
| FrequencyInfoUL-SIB SEQUENCE { |  |  |  |
| p-Max | 23 | 23 dBm |  |
| } |  |  |  |

Table 7.3.2.2.4.4.3-2: RACH-ConfigCommon for 2-step non-contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-128A | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { |  |  |  |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA |  |  |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 |  |  |
| msgA-SSB-SharedRO-MaskIndex-r16 | Not present |  |  |
| groupB-ConfiguredTwoStepRA-r16 | Not present |  |  |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | Not present |  |  |
| msgA-TransMax-r16 | N8 |  |  |
| msgA-RSRP-Threshold-r16 | RSRP\_69 +ΔDL |  |  |
| msgA-RSRP-ThresholdSSB-r16 | RSRP\_69 +ΔDL |  |  |
| msgA-SubcarrierSpacing-r16 | 120 kHz |  |  |
| msgA-RestrictedSetConfig-r16 | Not present |  |  |
| ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE { |  |  |  |
| ra-Prioritization-r16 | RA-Prioritization |  |  |
| ra-PrioritizationForAI-r16 | '10'B |  |  |
| } |  |  |  |
| ra-ContentionResolutionTimer-r16 | Not present |  |  |
| } |  |  |  |

Table 7.3.2.2.2.4.3-3: 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 { | 2 entries |  |  |
| ssb[1] | 0 |  |  |
| ssb[2] | 1 |  |  |
| 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\_69 +ΔDL | ΔDL is derived from the downlink calibration process | Subtest 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.2.2.4.4.3-3: RACH-ConfigGeneric for 2-step non-contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-130A | | | |
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { |  |  |  |
| msgA-PRACH-ConfigurationIndex-r16 | 190 |  |  |
| msgA-RO-FDM-r16 | four |  |  |
| msgA-RO-FrequencyStart-r16 | 0 |  |  |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 |  |  |
| msgA-PreamblePowerRampingStep-r16 | dB2 |  |  |
| msgA-PreambleReceivedTargetPower-r16 | -100 |  |  |
| msgB-ResponseWindow-r16 | sl10 |  |  |
| preambleTransMax-r16 | n10 |  |  |
| } |  |  |  |

Table 7.3.2.2.4.4.3-4: *ServingCellConfigCommonSIB* for 2-step non-contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| ssb-PositionsInBurst SEQUENCE { |  |  |  |
| inOneGroup | ‘1100 0000’B |  |  |
| } |  |  |  |
| ss-PBCH-BlockPower | 20 +ΔUL | ΔUL is derived from the uplink calibration process |  |
| } |  |  |  |

Table 7.3.2.2.4.4.3-5: MsgA-PUSCH-Config for 2-step non-contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-81B | | | |
| Information Element | Value/remark | Comment | Condition |
| MsgA-PUSCH-Resource-r16 ::= SEQUENCE { |  |  |  |
| msgA-MCS | 1 |  |  |
| nrofSlotsMsgA-PUSCH | 1 |  |  |
| nrofMsgA-PO-PerSlot | 1 |  |  |
| msgA-PUSCH-TimeDomainOffset | 1 |  |  |
| msgA-PUSCH-TimeDomainAllocation-r16 | 3 | Equivalent to PUSCH start symbol = 0 and allocation length = 10 |  |
| mappingTypeMsgA-PUSCH | typeA |  |  |
| nrofPRBs-PerMsgA-PO | 2 |  |  |
| nrofMsgA-PO-FDM | One |  |  |
| msgA-DMRS-AdditionalPosition | pos1 |  |  |
| msgA-PUSCH-NrofPorts | 1 |  |  |
| msgA-DeltaPreamble | 3 |  |  |
| msgA-Alpha | alpha1 |  |  |
| deltaMCS | Disabled |  |  |
| } |  |  |  |

7.3.2.2.4.5 Test requirement

Table 7.3.2.2.4.5-2 defines the primary level settings for 2-step non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.4.5-3, 7.3.2.2.4.5-4 and 7.3.2.2.4.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.4.5-1: General test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Comments |
| SSB Configuration | Config 1 |  | SSB.1 FR2 | As defined in A.3.10 |
| Duplex Mode for Cell 1 | Config 1 |  | TDD |  |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |  |
| BWchannel | Config 1 | MHz | 100: NRB,c = 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | Config 1 |  | SR3.1 TDD | As defined in A.3.1.1. |
| 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 |  |  |
| ss-PBCH-BlockPower | | dBm/ SCS | +20 +ΔUL | As defined in TS 38.331 [2].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power (PCMAX,f,c) | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| MsgA Configuration | |  | FR2 MsgA configuration 2 | As defined in A.3.20.3, with exceptions as defined below. |
| msgA-RSRP-ThresholdSSB | | dBm | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| msgA-PreambleReceivedTargetPower | | dBm | -100 | As defined in TS 38.331 [2] |
| Note 1: OCNG shall be used such that 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: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | |

Table 7.3.2.2.4.5-2 OTA-related test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Comments |
| AoA setup | |  | Setup 1 | As defined in A.9.1 |
| Assumption for UE beams Note 2 | |  | Rough |  |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
|  | SSB\_RP | dBm/SCS | -80.6 |
|  | Es/IotBB | dB | 21.09 |  |
|  | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
|  | SSB\_RP | dBm/SCS | -95.0 |
|  | Es/IotBB | dB | 6.69 |  |
|  | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | AWGN |  |
| Note 1: No artificial noise is applied in this test.  Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

Test 1: Correct behaviour when transmitting MsgA

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

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Table 7.3.2.2.4.5-3: Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± FFS dB |

Table 7.3.2.2.4.5-4: Relative power tolerance Test requirements

|  |  |  |
| --- | --- | --- |
| Measured power | Power step P (dB) | MsgA (dB) |
| Measured power of both MsgAs being compared > (PmaxNote1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either MsgAs being compared ≤ (PmaxNote1 – 6dB) | ± (6+FFS) |
| Note 1: Pmax is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

Table 7.3.2.2.4.5-5: Te Timing error Test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(KHz) | Te |
| 2 | 120 | 120 | 224+[48]\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

#### 7.3.2.3 RRC connection release with redirection

##### 7.3.2.3.0 Minimum conformance requirements

7.3.2.3.0.1 Minimum conformance requirements for FR2-FR2 RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within Tconnection\_release\_redirect\_NR.

The time delay (Tconnection\_release\_redirect\_NR) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay (Tconnection\_release\_redirect\_NR) shall be less than:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- SSB\_RP and SSB Ês/Iot according to 38.133 [6] Annex B.2.5 for a corresponding NR Band.

TRRC\_procedure\_delay: It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause 6.2.2 of TS 38.331 [13].

Tidentify-NR: It is the time to identify the target NR cell and depend on the frequency range (FR) of the target NR cell. It is defined in table 7.3.2.3.0.1-1. Note that Tidentify-NR = TPSS/SSS-sync + Tmeas, in which TPSS/SSS-sync is the cell search time and Tmeas is the measurement time due to cell selection criteria evaluation.

TSI-NR: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. TSI-NR = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

TRACH: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in TS 38.211 [7] Table 6.3.3.2-4 for FR2.

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with Trs = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,

- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 7.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

|  |  |
| --- | --- |
| Frequency range (FR) of target NR cell | Tidentify-NR |
| FR1 | MAX (680 ms, [11] x Trs) |
| FR2 | MAX (880 ms, 8x[11] x Trs) |
| Note : If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2.3.2.1.

##### 7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR-to-NR requirements specified in clause 7.2.3.2.0.

7.3.2.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting SA FR2.

7.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.7.3.2.3.1.

7.3.2.3.1.4 Test description

7.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.3.1.4.1-1.

Table 7.3.2.3.1.4.1-1: Test configurations for NR SA FR2-FR2 RRC connection release with redirection

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.3.2.3.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.3.1.4.1-2.

Table 7.3.2.3.1.4.1-2: Initial conditions for NR SA FR2-FR2 RRC connection release with redirection

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.5 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.2.3.1.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.2.3.1.4.1-3.

Table 7.3.2.3.1.4.1-3: General test parameters for NR SA FR2-FR2 RRC connection release with redirection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 3.2 |  |

7.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant in which the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.2.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.

5. If the UE transmits the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. After T2 expires, the UE shall be switched off. The SS shall then set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for the next iteration of the test procedure loop. Afterwards the UE shall be switched on. Go to step 1.

7. Repeat step 2-6 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.3.1.4.3 Message contents

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

Table 7.3.2.3.1.4.3-1: RRCRelease (step 3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcRelease SEQUENCE { | |  |  |  |
| redirectedCarrierInfo CHOICE { | |  |  |  |
| nr SEQUENCE { | |  |  |  |
| carrierFreq | | ARFCN-ValueNR | Frequency of Cell 2 |  |
| ssbSubcarrierSpacing | | kHz120 |  |  |
| smtc SEQUENCE { | |  |  |  |
| duration | | sf1 |  | SMTC.1 |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.3.2.3.1.4.3-2: SIB2

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionInfoCommon SEQUENCE { |  |  |  |
| rangeToBestCell | Not present |  |  |
| } |  |  |  |

7.3.2.3.1.5 Test requirement

Table 7.3.2.3.1.5-1 defines the primary level settings for NR SA FR2-FR2 RRC connection release with redirection.

Table 7.3.2.3.1.5-1: Cell specific test parameters for NR SA FR2-FR2 RRC connection release with redirection

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | Rough | | |
| AoA setup | | |  | Setup 1 as defined in A.9 | | | | | | |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | | |  | 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | |  | SR.3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | | |  | CR.3.1 TDD | | | | | | |
| Control Channel RMC | | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC configuration | | |  | SMTC.1 FR2 | | | | | | |
| SSB Configuration | | |  | SSB.3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | PRACH.1 FR2 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | | |  | TCI.State.2 | | | | | | |
| 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 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -104.7 | | | -104.7 | | | |
| Note2 |  | | dBm/SCS | -95.7 | | | -95.7 | | | |
|  | | | dB | 5 | 5 | | -Infinity | | 5 | |
|  | | | dB | 5 | 5 | | -Infinity | | 5 | |
| IoNote3 |  | | dBm/BW | -60.5 | -60.5 | | -66.7 | | -60.5 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH,

where:

TRRC\_procedure\_delay = 110 ms in the test.

Tidentify-NR = 1760 ms in the test.

TSI-NR = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target NR cell.

TRACH = 10 ms in the test.

This gives a total of 3160 ms.

### 7.3.3 Conditional handover

#### 7.3.3.0 Minimum conformance requirements

##### 7.3.3.0.1 Minimum conformance requirements for NR FR2 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover seconds from the end of the last TTI containing the RRC command.

DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

Where:

TRRC is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

Tmeasure is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

TCHO\_execution is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

Tinterrupt is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

[TS 38.133, clause 6.1.4.4.2]

The measurement time delay is defined from the end of TEvent\_DU until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra with index or Tidentify\_intra\_without\_index defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover. If a cell which has been detectable at least for the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than TSSB\_measurement\_period\_intra or TSSB\_measurement\_period\_inter provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

TCHO\_execution is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. TCHO\_execution can be up to 10ms.

[TS 38.133, clause 6.1.4.4.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms

Where:

Tprocessing is time for UE processing. Tprocessing can be up to 20ms.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be 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]

T∆ is time for fine time tracking and acquiring full timing information of the target cell. TΔ = Trs.

Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.[TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] clause 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] clauses 10.1.3 for FR2, for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within Tidentify\_intra\_without\_index if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in TS38.133 [6] Table 9.2.5.1-2

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in TS38.133 [6] Table 9.2.5.2-2

CSSFintra: it is a carrier specific scaling factor and is determined

according to CSSFoutside\_gap,i in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

Mpss/sss\_sync\_w/o\_gaps: For a UE supporting FR2 power class 1, Mpss/sss\_sync\_w/o\_gaps =40. For a UE supporting power class 2, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2 power class 3, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2 power class 4, Mpss/sss\_sync\_w/o\_gaps =24

Mmeas\_period\_w/o\_gaps : For a UE supporting power class 1, Mmeas\_period\_w/o\_gaps =40. For a UE supporting FR2 power class 2, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 3, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 4, Mmeas\_period\_w/o\_gaps =24.

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

For FR2,

Klayer1\_measurement=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions

Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

[TS 38.133, clause 9.2.5.1]

The measurement period for intra-frequency measurements without gaps is as shown in 38.133 [6] Table 9.2.5.2-2.

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 9.2.5.2-2: Measurement period for intra-frequency measurements without gaps(FR2)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra |
| No DRX | max(400ms, ceil(Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mmeas\_period\_w/o\_gaps xKp x Klayer1\_measurement ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

[TS 38.133, clause 10.1.3.1.1]

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in TS 38.133 [6] Table 10.1.3.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [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.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 10.1.3.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | | | |
|  |  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSSSB Note 1 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±6 | ±9 | ≥-6 | Same value as SSB\_RP in TS 38.133 [6] Table B.2.2-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±8 | ±11 |  | N/A | | -70 | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.  Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  Note 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

[TS 38.133, annex B.2.2]

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in TS 38.133 [6] Table B.2.2-2 for FR2 NR cells.

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2, Note 3 | | | | | | SSB Ês/Iot |
|  |  |  | dBm / SCSSSB | | | | | | dB |
|  |  |  | SCSSSB = 120 kHz | | | | | SCSSSB = 240 kHz |  |
|  |  |  | UE Power class | | | | | UE Power class |  |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 1, 2, 3, 4, 5 |  |
| Conditions | Rx Beam Peak | n257 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | -123.4+Y5 | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 |
|  |  | n258 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | -123.6+Y5 |  |  |
|  |  | n260 | -125.3+Y1 |  | -109.5 | -125.8+Y4 |  |  |  |
|  |  | n261 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |  |  |  |
| n262 | -123.3+Y1 | -108,6 | -106.6 | -121.8+Y4 |  |
|  | Spherical coverage Note 1 | n257 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | -115.4+Z5 | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 |
|  |  | n258 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | -115.6+Z5 |  |  |
|  |  | n260 | -117.3+Z1 |  | -96.9 | -113.8+Z4 |  |  |  |
|  |  | n261 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |  |  |  |
| n262 | -115.1+Z1 | -96.7 | -93.5 | -109.7+Z4 |  |
| Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [3]. Side condition applies for directions in which EIS spherical coverage requirement is met.  Note 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.  Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and Spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [3]. | | | | | | | | | |

##### 7.3.3.0.2 Minimum conformance requirements for NR FR2 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover seconds from the end of the last TTI containing the RRC command.

DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

Where:

TRRC is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

Tmeasure is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

TCHO\_execution is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

Tinterrupt is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

[TS 38.133, clause 6.1.4.4.2]

The measurement time delay is defined from the end of TEvent\_DU until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra with index or Tidentify\_intra\_without\_index defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover. If a cell which has been detectable at least for the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than TSSB\_measurement\_period\_intra or TSSB\_measurement\_period\_inter provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

TCHO\_execution is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. TCHO\_execution can be up to 10ms.

[TS 38.133, clause 6.1.4.4.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms

Where:

Tprocessing is time for UE processing. Tprocessing can be up to 20ms.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be 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]

T∆ is time for fine time tracking and acquiring full timing information of the target cell. TΔ = Trs.

Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

[TS 38.133, clause 9.3.2]

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 TS 38.133 [6] clauses 10.1.5 for FR2, for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in 38.133 [6] Table 9.3.4-2.

TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in 38.133 [6] Table 9.3.4-4.

TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in 38.133 [6] Table 9.3.5-2.

Mpss/sss\_sync\_inter: For a UE supporting FR2 power class 1, Mpss/sss\_sync\_inter = 64 samples. For a UE supporting FR2 power class 2, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2 power class 3, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2 power class 4, Mpss/sss\_sync\_inter = 40 samples.

MSSB\_index\_inter: For a UE supporting FR2 power class 1, MSSB\_index\_inter = 40 samples. For a UE supporting FR2 power class 2, MSSB\_index\_inter = 24 samples. For a UE supporting FR2 power class 3, MSSB\_index\_inter = 24 samples. For a UE supporting FR2 power class 4, MSSB\_index\_inter = 24 samples.

Mmeas\_period\_inter: For a UE supporting FR2 power class 1, Mmeas\_period\_inter =64 samples. For a UE supporting FR2 power class 2, Mmeas\_period\_inter=40 samples. For a UE supporting FR2 power class 3, Mmeas\_period\_inter =40 samples. For a UE supporting FR2 power class 4, Mmeas\_period\_inter = 40 samples.

CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX | Max(600ms, Mpss/sss\_sync\_inter × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, (1.5 × Mpss/sss\_sync\_inter) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Mpss/sss\_sync\_inter × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(200ms, MSSB\_index\_inter × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, (1.5 × MSSB\_index\_inter) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | MSSB\_index\_inter × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in TS 38.133 [6] Table and 9.3.5-2:

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(400ms, Mmeas\_period\_inter × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(400ms, (1.5 × Mmeas\_period\_inter) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Mmeas\_period\_inter × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

[TS 38.133, clause 10.1.5.1.1]

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in TS 38.133 [6] Table 10.1.5.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding Band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 10.1.5.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | | | |
|  |  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSSSB Note 1 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±6 | ±9 | ≥-4 | Same value as SSB\_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±8 | ±11 |  | N/A | | -70 | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.  Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  Note 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

[TS 38.133, annex B.2.3]

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2, Note 3 | | | | | | SSB Ês/Iot |
|  |  |  | dBm / SCSSSB | | | | | | dB |
|  |  |  | SCSSSB = 120 kHz | | | | | SCSSSB = 240 kHz |  |
|  |  |  | UE Power class | | | | | UE Power class |  |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 1, 2, 3, 4, 5 |  |
| Conditions | Rx Beam Peak | n257 | -126.3+Y1 | -111.8 | -110.1 | -125.8+Y4 | -121.4+Y5 | (Value for SCSSSB = 120 kHz) +3dB | ≥-4 |
|  |  | n258 | -126.3+Y1 | -111.8 | -110.1 | -125.8+Y4 | -121.6+Y5 |  |  |
|  |  | n260 | -123.3+Y1 |  | -107.5 | -123.8+Y4 |  |  |  |
|  |  | n261 | -126.3+Y1 | -111.8 | -110.1 | -125.8+Y4 |  |  |  |
| n262 | -121.3+Y1 | -106.6 | -104.6 | -119.8+Y4 |  |
|  | Spherical coverage Note 1 | n257 | -118.3+Z1 | -100.8 | -99.2 | -116.8+Z4 | -113.4+Z5 | (Value for SCSSSB = 120 kHz) +3dB | ≥-4 |
|  |  | n258 | -118.3+Z1 | -100.8 | -99.2 | -116.8+Z4 | -113.6+Z5 |  |  |
|  |  | n260 | -115.3+Z1 |  | -94.9 | -111.8+Z4 |  |  |  |
|  |  | n261 | -118.3+Z1 | -100.8 | -99.2 | -116.8+Z4 |  |  |  |
| n262 | -113.1+Z1 | -94.7 | -91.5 | -107.7+Z4 |  |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [3]. Side condition applies for directions in which EIS spherical coverage requirement is met.  NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.  NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and Spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [3]. | | | | | | | | | |

#### 7.3.3.1 NR SA FR2 conditional handover

Editor’s Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz.
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.3.3.1.1 Test purpose

To verify the requirement for the NR FR2 intra frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

7.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

7.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.1.

7.3.3.1.4 Test description

7.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.1.4.1-1.

Table 7.3.3.1.4.1-1: NR SA FR2 conditional handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 7.3.3.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 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 7.3.3.1.4.1-2

Table 7.3.3.1.4.1-2: Initial conditions for NR SA FR2 conditional handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.3.1.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 7.3.3.1.4.1-3: General test parameters for NR SA FR2 conditional handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset for condition | | dBm | -2Note 1 | Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger. |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | |

7.3.3.1.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.1.4.1-3 and 7.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than TRRC ms before the beginning of T2. No interruption shall be observed in time period T1. where,

- TRRC = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the start of T2. The Interruption length Tinterrupt shall also be verified in T2.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.1.5-1. T2 starts.

7. If

1. the UE transmits the PRACH preambles to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the beginning of time period T2,

and

1. no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- X = 8∙Tinterrupt for test configuration 7.3.3.1-1

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 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.

7.3.3.1.4.3 Message contents

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

Table 7.3.3.1.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR\_MEAS and CHO | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| measConfig | | MeasConfig | Table 7.3.3.1.4.3-2 |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| conditionalReconfiguration-r16 | | ConditionalReconfiguration | Table 7.3.3.1.4.3-5 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.3.3.1.4.3-2: MeasConfig (Table 7.3.3.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR | Table 7.3.3.1.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 7.3.3.1.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry |  |  |
| MeasIdToAddMod[1] SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measObjectId | 1 |  |  |
| reportConfigId | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 |  |  |
| } |  |  |  |

Table 7.3.3.1.4.3-3: MeasObjectNR (Table 7.3.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { |  |  |  |
| ssbFrequency | ARFCN-ValueNR for PCell |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 7.3.3.1.4.3-4: ReportConfigNR (Table 7.3.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| condTriggerConfig SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -4 | actuall value = -4\*0.5 = -2dB |  |
| } |  |  |  |
| hysteresis | 0 | actuall value = 0\*0.5 = 0dB |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.3.1.4.3-5: ConditionalReconfiguration (Table 7.3.3.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
| Information Element | Value/remark | Comment | Condition |
| ConditionalReconfiguration-r16::= SEQUENCE { |  |  |  |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry |  |  |
| CondReconfigToAddMod-r16 [1] SEQUENCE { |  | entry 1 |  |
| condReconfigId-r16 | 1 |  |  |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry |  |  |
| MeasId[1] | 1 | The MeasId configured in Table 7.3.3.1.4.3-2 |  |
| } |  |  |  |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig\_NoKeyChange) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.3.3.1.5 Test requirements

Table 7.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.3.1.5-1: Cell specific test parameters for NR SA FR2 conditional handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 1 | | |
| AoA setup | | |  | Setup 1 as defined in A.9 | | | | | | |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | |  | SR3.1 TDD | | | | | | |
| CORESET Reference Channel | | |  | CR3.1 TDD | | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | |  | SSB.1 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| TCI configuration | | |  | CSI-RS.Config.0 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -106.2 Note 7 | | | -106.2 Note 7 | | | |
| Note2 | Config 1 | | dBm/SCS | -97.2 | | | -97.2 | | | |
| Ês/IotBB Note9 | | | dB | 4.69 | -5.44 | | -Infinity | | 3.73 | |
|  | | | dB | 6 | 6 | | -Infinity | | 11 | |
| IoNote3 | Config 1 | | dBm/  BW | -61.21 | -55.73 | | -61.21 | | -55.73 | |
| Propagation condition | | | - | AWGN | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 7: Including test tolerance given in Annex F.1.3.2.  Note 8: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for infomation purposes. They are not settable parameters themseleves.  Note 9: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [3] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor ΔMBS specified in TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | | | | | | |

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

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt from the start of T2. where:

- Tmeasure = 1600 ms for power class 1 UE and 1080ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

- TCHO\_execution = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

- Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

- Tprocessing = 20 ms, is time for UE processing;

- TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;

- T∆ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;

- Tmargin = 2 ms, is time for SSB post-processing.

This gives a total of 1672 ms for power class 1 UE and 1152 ms for power class 2/3/4 UE.

The interruption during T2 shall not exceeed Tinterrupt = 62ms.

#### 7.3.3.2 NR SA FR2-FR2 conditional handover

Editor’s Note: This test case is incomplete in following aspects:

- TT analysis is missing.

- Some test parameters are still FFS

7.3.3.2.1 Test purpose

To verify the requirement for the NR FR2 inter-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

7.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

7.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.2.

7.3.3.2.4 Test description

7.3.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.2.4.1-1.

Table 7.3.3.2.4.1-1: NR SA FR2-FR2 conditional handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 7.3.3.2-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 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 7.3.3.2.4.1-2

Table 7.3.3.2.4.1-2: Initial conditions for NR SA FR2-FR2 conditional handover

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.4.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.3.3.2.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 7.3.3.2.4.1-3: General test parameters for NR SA FR2-FR2 conditional handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset for handover condition | | dB | FFS |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤7 |  |

7.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carriers and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.2.4.1-3 and 7.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than TRRC ms before the beginning of T2. No interruption shall be observed in time period T1. where,

- TRRC = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the start of T2. The Interruption length Tinterrupt shall also be verified in T2.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.2.5-1. T2 starts.

7. If

1. the UE transmits the PRACH preambles to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the beginning of time period T2,

and

1. no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- X = 8∙Tinterrupt for test configuration 7.3.3.2-1

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 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.

7.3.3.2.4.3 Message contents

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

Table 7.3.3.2.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR\_MEAS and CHO | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| measConfig | | MeasConfig | Table 7.3.3.2.4.3-2 |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| conditionalReconfiguration-r16 | | ConditionalReconfiguration | Table 7.3.3.2.4.3-6 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.3.3.2.4.3-2: MeasConfig (Table 7.3.3.2.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entry |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR-f1 | Table 7.3.3.2.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod[2] SEQUENCE { |  | entry 2 |  |
| measObjectId | 2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR-f2 | Table 7.3.3.2.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 7.3.3.2.4.3-5 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry |  |  |
| MeasIdToAddMod[1] SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measObjectId | 2 |  |  |
| reportConfigId | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 |  |  |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 |  |  |
| } |  |  |  |

Table 7.3.3.2.4.3-3: MeasObjectNR-f1 (Table 7.3.3.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { |  |  |  |
| ssbFrequency | ARFCN-ValueNR for Cell 1 |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 7.3.3.2.4.3-4: MeasObjectNR-f2 (Table 7.3.3.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { |  |  |  |
| ssbFrequency | ARFCN-ValueNR for Cell 2 |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 7.3.3.2.4.3-5: ReportConfigNR (Table 7.3.3.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| condTriggerConfig SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | FFS |  |  |
| } |  |  |  |
| hysteresis | 0 | actuall value = 0\*0.5 = 0dB |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.3.3.2.4.3-6: ConditionalReconfiguration (Table 7.3.3.2.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
| Information Element | Value/remark | Comment | Condition |
| ConditionalReconfiguration-r16::= SEQUENCE { |  |  |  |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry |  |  |
| CondReconfigToAddMod-r16 [1] SEQUENCE { |  | entry 1 |  |
| condReconfigId-r16 | 1 |  |  |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry |  |  |
| MeasId[1] | 1 | The MeasId configured in Table 7.3.3.2.4.3-2 |  |
| } |  |  |  |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig\_NoKeyChange) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.3.3.2.5 Test requirements

Table 7.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.3.2.5-1: Cell specific test parameters for NR SA FR2-FR2 conditional handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| AoA setup | | |  | Setup 1 as defined in A.9 | | | | | | |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| Gap pattern ID | | |  | gp0 | | | | | | |
| PDSCH Reference measurement channel | | |  | SR3.1 TDD | | | | | | |
| CORESET Reference Channel | | |  | CR3.1 TDD | | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | |  | SSB.1 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| TCI configuration | | |  | CSI-RS.Config.0 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -104.7 | | | -104.7 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -95.7 | | | -95.7 | | | |
|  | Config 3 | |  | -95.7 | | | -95.7 | | | |
|  | | | dB | 5 | 5 | | -Infinity | | 5 | |
|  | | | dB | 5 | 5 | | -Infinity | | 5 | |
| IoNote3 | Config 1,2 | | dBm/  BW | -60.5 | -60.5 | | -66.7 | | -60.5 | |
|  | Config 3 | | dBm/  BW | -60.5 | -60.5 | | -66.7 | | -60.5 | |
| Propagation condition | | | - | AWGN | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

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

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt from the start of T2. where:

- Tmeasure = 6720 ms for power class 1 UE and 4160 ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

- TCHO\_execution = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

- Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

- Tprocessing = 20 ms, is time for UE processing;

- TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;

- T∆ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;

- Tmargin = 2 ms, is time for SSB post-processing.

This gives a total of 6792 ms for power class 1 UE and 4232 ms for power class 2/3/4 UE.

The interruption during T2 shall not exceeed Tinterrupt = 62ms.

## 7.4 Timing

### 7.4.1 UE transmit timing

#### 7.4.1.0 Minimum Conformance Requirements

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

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 7.4.1.0.1-1. This requirement applies:

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

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

 (in *Tc* units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. *N*TA for other channels is not changed until next timing advance is received. The value ofdepends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). is defined in Table 7.4.1.0.1-2.

Table 7.4.1.0.1-1: Te Timing Error Limit

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

Table 7.4.1.0.1-2: The Value of 

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

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

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

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

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

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

where the maximum autonomous time adjustment step Tq and the aggregate adjustment rate Tp are specified in Table 7.4.1.0.1-3.

Table 7.4.1.0.1-3: Tq Maximum Autonomous Time Adjustment Step and Tp Minimum Aggregate Adjustment rate

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

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

#### 7.4.1.1 NR SA FR2 UE transmit timing accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- Handling of PC6 devices via *HighSpeedMeasFlagFR2-r17* signalling is FFS

7.4.1.1.1 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. This test will verify the requirements in clause 7.1.2 of TS 38.133 [6].

7.4.1.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SA FR2.

7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.1.1

7.4.1.1.4 Test Description

7.4.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 7.4.1.1.4.1-1.

Table 7.4.1.1.4.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.4.1.1.4.1-2

Table 7.4.1.1.4.1-2: Initial conditions for NR SA FR2 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, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.4.1.1.4.3.

2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.4.1.1.4.2 Test procedure

The test consists of a single NR FR2 cell (PCell). The downlink timing of the PCell 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. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test:

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

2. Setup NR PCell according to parameters given in Table 7.4.1.1.4.1-1.

3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 7.4.1.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. Set the UE in the Rx beam peak direction found with one of the Rx Beam Peak Search procedures described in Annex I. Allow at least BEAM\_SELECT\_WAIT\_TIME (NOTE 1) for the UE Rx beam selection to complete.

6. 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 (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 13792 for FR2

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.4.1.1.5-4.

7. The test system shall adjust the timing of the DL path by values given in Table 7.4.1.1.4.2-1

Table 7.4.1.1.4.2-1: Adjustment Value for DL Timing

|  |  |  |
| --- | --- | --- |
| SCS of SSB signals (KHz) | Adjustment Value | |
|  | Test1 | Test2 |
| 240 | +8\*64Tc | +4\*64Tc |

8. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 7.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size Tq between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3, 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 7.4.1.0.1 and Table 7.4.1.0.1-3 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 7.4.1.1.4.2-1.

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

NOTE: The BEAM\_SELECT\_WAIT\_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

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 7.4.1.1.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Specific message contents exceptions for Test Configuration 7.4.1.1-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

Table 7.4.1.1.4.3-1: *SRS-Config* for UE transmit timing accuracy for NR SA FR2 UE

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |
| freqHopping SEQUENCE { |  |  |  |
| c-SRS | 17 |  |  |
| } |  |  |  |
| groupOrSequenceHopping | Neither |  |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| periodicityAndOffset-p CHOICE { |  |  |  |
| sl1 | 0 |  | Test 1 |
| sl2560 | 4 |  | Test 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.4.1.1.4.3-2: *DRX-Config* for UE transmit timing accuracy Test 2 for NR SA FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
| 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 |  |
| } |  |  |  |

7.4.1.1.5 Test Requirements

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 7.4.1.1.5-4.

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

 (in *Tc* units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance was applied. *N*TA for other channels is not changed until next timing advance is received. The value ofdepends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). is defined in Table 7.4.1.1.5-5.

Table 7.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test1 | | | Test2 | |
| SSB ARFCN |  | 1 | Freq1 | | | Freq1 | |
| Duplex Mode |  | 1 | TDD | | | | |
| TDD configuration |  | 1 | | TDDConf.3.1 | | | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | | | | |
| Data RBs allocated |  | 1 | 66 | | | | |
| Initial BWP Configuration |  | 1 | DLBWP.0.1  ULBWP.0.1 | | | | |
| Dedicated BWP Configuration |  | 1 | DLBWP.1.1  ULBWP.1.1 | | | | |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | | |
| DRx Cycle | ms | 1 | N/A | | | | DRX.8Note5 |
| PDSCH Reference measurement channel |  | 1 | SR.3.3 TDD | | | | |
| RMSI CORESET Reference Channel |  | 1 | CR.3.2 TDD | | | | |
| Dedicated CORESET Reference Channel |  | 1 | CCR.3.7 TDD | | | | |
| OCNG Patterns |  | 1 | OP.1 | | | | |
| SSB Configuration |  | 1 | SSB.4 FR2 | | | | |
| SMTC Configuration |  | 1 | SMTC.1 | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 120 | | | | |
| EPRE ratio of PSS to SSS | dB | 1 | 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) |  |  |  | | |  | |
| Propagation condition |  | 1 | AWGN | | | | |
| SRS Config |  | 1 | SRSConf.1Note6 | | SRSConf.2Note6 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: DRx related parameters are given in Table A.5-1  Note 6: SRS configs are given in Table A.7.4.1.1.5-2 | | | | | | | |

Table 7.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |  |
| srs-ResourceIdList | 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  startPosition | 0 | 0 |  |
| resourceMapping  nrofSymbols | n1 | n1 |  |
| resourceMapping  repetitionFactor | n1 | n1 |  |
| freqDomainPosition | 0 | 0 |  |
| freqDomainShift | 0 | 0 |  |
| freqHopping  c-SRS | 17 | 17 | Matches NRB,c |
| freqHopping  b-SRS | 0 | 0 |  |
| freqHopping  b-hop | 0 | 0 |  |
| groupOrSequenceHopping | Neither | Neither |  |
| resourceType | Periodic | Periodic |  |
| periodicityAndOffset-p | sl1,0 | sl2560,4 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | Any 10 bit number |

Table 7.4.1.1.5-3: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Angle of arrival configuration |  | Setup 1 defined in A.9.1 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -100 | |
|  | dB | 4 | |
| SS-RSRPNote2 | dBm/SCS Note4 | -96 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: Void  NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone  NOTE 6: Information about types of UE beam is given in TS 38.133 [6] section B.2.1.3, and does not limit UE implementation or test system implementation | | | |

Table 7.4.1.1.5-4: Te Timing Error Limit

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals ( kHz)** | **SCS of uplink signals ( kHz)** | **Te** |
| 2 | 120 | 60 | N/A |
| 120 | N/A |
| 240 | 60 | N/A |
| 120 | 3.75\*64\*Tc |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6] | | | |

Table 7.4.1.1.5-5: Tq Maximum Autonomous Time Adjustment Step and Tp Minimum Aggregate Adjustment rate

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency Range | SCS of uplink signals (KHz) | The Maximum timing change in one adjustment Tq | The Minimum aggregate adjustment rate Tp | The Maximum aggregate adjustment rate Tq |
| 2 | 120 | 3.125\*64\*Tc | -1.225\*64\*Tc | +3.725\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6] | | | |  |

Table 7.4.1.1.5-6: The Value of 

|  |  |
| --- | --- |
| Frequency range and band of cell used for uplink transmission | (Unit: TC) |
| FR2 | 13792 |
| NOTE 1: The UE identifies  based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of  is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of  can also be provided for a FDD serving cell.  NOTE 2: Void | |

### 7.4.2 UE timer accuracy

FFS.

### 7.4.3 Timing advance

#### 7.4.3.0Minimum conformance requirements

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

The timing advance is initiated from gNB with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

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 7.4.3.0.3-1, 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 7.4.3.0.3-1: UE Timing Advance adjustment accuracy

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

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.3.

#### 7.4.3.1 NR SA FR2 timing advance adjustment accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.4.3.1.1 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].

7.4.3.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward, supporting SA FR2.

7.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.4.3.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.3.1.

7.4.3.1.4 Test description

7.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [17].

This test shall be tested using any of the test configurations in Table 7.4.3.1.4.1-1.

Table 7.4.3.1.4.1-1: NR SA FR2 timing advance adjustment accuracy supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.4.3.1.4.1-2

Table 7.4.3.1.4.1-2: Initial conditions for NR SA FR2 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, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

Table 7.4.3.1.4.1-3: General test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF channel number |  | 1 |  |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 of TS 38.133 [6] |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 of TS 38.133 [6] |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 of TS 38.133 [6] |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 of TS 38.133 [6] |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | For 120 kHz SCS NTA\_new = NTA\_old + 1024\*Tc (based on equation in clause 4.2 of TS 38.213 [3]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

1. Message contents are defined in clause 7.4.3.1.4.3.

2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.4.3.1.4.2 Test Procedure

The test consists of a single NR FR2 cell, Cell 1, which is the PCell in the primary Timing Advance Group (pTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for pTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 7.4.3.1.5-1 and Table 7.4.3.1.5-2, 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 PCell in pTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 7.4.3.1.4.3.

2. Set the parameters according to values in Tables 7.4.3.1.4.1-3 and Table 7.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

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

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for pTAG, with Timing Advance Command value of 39 as specified in table 7.4.3.1.4.1-3.

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

8. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay shall be considered 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, 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 7.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjusts the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 7.4.3.0.3-1 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 RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. After the RRC connection release, the SS transmits a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC\_CONNECTED according to TS 38.508-1 [14] clause 4.5 or if the paging fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED according to TS 38.508-1 [14] clause 4.5. Message contents are set as defined in clause 7.4.3.1.4.3.

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

7.4.3.1.4.3 Message Contents

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

Table 7.4.3.1.4.3-0: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Specific message contents exceptions for Test Configuration 7.4.1.1-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |

Table 7.4.3.1.4.3-1: SRS-Config for NR SA FR2 timing advance adjustment accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| 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 { | 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 | 16 |  |  |
| } |  |  |  |
| groupOrSequenceHopping | Neither |  |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { | Periodic |  |  |
| periodicityAndOffset-p CHOICE { |  |  |  |
| sl5 | 4 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PCell in pTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where *k* = 11.

The Timing Advance adjustment accuracy for PCell in pTAG shall be within the limits specified in Table 7.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90% with a confidence level of 95%.

Table 7.4.3.1.5-1, Table 7.4.3.1.5-1a and Table 7.4.3.1.5-2 define the primary level settings.

Table 7.4.3.1.5-1: Cell specific test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test1 | |
|  |  | T1 | T2 |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | |
| BWP BW | MHz | 100: NRB,c = 66 | |
| DRx Cycle | ms | Not Applicable | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | |
| CORESET Reference Channel |  | CR.3.1 TDD | |
| OCNG Patterns |  | OCNG pattern 1 | |
| TRS configuration |  | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state |  | TCI.State.2 | |
| SMTC configuration |  | SMTC.1 FR2 | |
| SSB Configuration |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 kHz | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |  | |
| EPRE ratio of PBCH to PBCH DMRS |  |  | |
| EPRE ratio of PDCCH DMRS to SSS |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  | |
| EPRE ratio of PDSCH DMRS to SSS |  |  | |
| EPRE ratio of PDSCH to PDSCH |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  | |
| Propagation condition | - | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone | | | |

Table 7.4.3.1.5-1a: OTA specific test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | |
|  |  | T1 | T2 |
| Angle of arrival configuration |  | Setup 1 as defined in A.9 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -103 | |
|  | dB | 4 | |
| SS-RSRPNote2 | dBm/SCS Note4 | -99 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone  NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | |

Table 7.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| c-SRS | 16 | Frequency hopping is disabled |
| 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=4 | 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 [13]. | | |

Table 7.4.3.1.5-3: UE Timing Advance adjustment accuracy

|  |  |  |
| --- | --- | --- |
| UL Sub Carrier Spacing(kHz) | 60 | 120 |
| UE Timing Advance adjustment accuracy | ±128 Tc | ±72 Tc |

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

## 7.5 Signalling characteristics

### 7.5.1 Radio link monitoring

#### 7.5.1.0 Minimum conformance requirements

##### 7.5.1.0.1

##### 7.5.1.0.2

##### 7.5.1.0.3

##### 7.5.1.0.4

##### 7.5.1.0.5 Minimum conformance requirements for UE scheduling restrictions during radio link monitoring

[TS 38.133, clause 8.1.7.3]

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,

- There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.

- Otherwise

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,

- The gap between UE’s reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

#### 7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

7.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.1.

7.5.1.1.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to ‘rlf’. Supported test configurations are shown in table 7.5.1.1.4.1-1. The test parameters are given in Tables 7.5.1.1.4.1-3, 7.5.1.1.5-1, and 7.5.1.1.5-2 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.1.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Chart, box and whisker chart

Description automatically generated

Figure 7.5.1.1.4-1: SNR variation for out-of-sync testing



Figure 7.5.1.1.4-2: Time multiplexed downlink transmissions

7.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.1.4.1-1.

Table 7.5.1.1.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.1.1-1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.1.4.1-2

Table 7.5.1.1.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell 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.1.2, 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 7.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.4.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell are given in Table 7.5.1.1.4.1-3

2. Message contents are defined in clause 7.5.1.1.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.1.4.1-3: General test parameters for FR2 out-of-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.4 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.5 |
| CP length | | |  | Normal |
| 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 for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 9.68 |
| T3 | | | s | 9.68 |
| D1 | | | s | 9.64 |
| 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. | | | | |

7.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.1.4.1-3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.1.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.1.5-1. T3 starts.

5. If the SS:  
  
a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and  
  
b) does not detect any uplink power from time point C ([240] ms 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 7.5.1.1.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.5.1.1.4.3 Message Contents

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

Table 7.5.1.1.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)  Table H.3.1-4 with A3-offset = 0  Table H.3.1-6 with Condition RLM  Table H.3.1-7  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.5.1.1.4.3-1: Void

Table 7.5.1.1.4.3-2: UE-TimersAndConstants

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-200 | | | |
| Information Element | Value/remark | Comment | Condition |
| UE-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| t311 | ms1000 |  |  |
| n311 | n1 |  |  |
| } |  |  |  |

Table 7.5.1.1.4.3-3: Void

7.5.1.1.5 Test Requirement

Table 7.5.1.1.4.1-3 and 7.5.1.1.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

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

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

The UE shall stop transmitting uplink signal 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 7.5.1.1.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | |
|  | |  | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | |  | Setup 3 defined in A.9.3 | | | | | |
|  | |  | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 5 | |  | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |  | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | |  | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |  | | |
| ssb-Index 0 SNR | Config 1 | dB | 4.1Note 6 | -3.9Note 6 | -15 |  | | |
| ssb-Index 1 SNR | Config 1 |  | Not sent | | | 4.1Note 6 | -15 | -15 |
|  | Config 1 | dBm/ 15kHz | -94.8 | | | -94.8 | | |
| Time multiplexing of the downlink transmissions from each AoA | |  | Defined in Figure 7.5.1.1.4-2 | | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such 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 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 38.133 [6] A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | |

Table 7.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |

#### 7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

7.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.2.

7.5.1.2.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to ‘rlf’. Supported test configurations are shown in table 7.5.1.2.4-1. The test parameters are given in Tables 7.5.1.2.4.1-3 and 7.5.1.2.5-1 below. There is one cell (Cell 1), which is the active cell, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.2.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Chart, box and whisker chart

Description automatically generated

Figure 7.5.1.2.4-1: SNR variation for in-sync testing



Figure 7.5.1.2.4-2: Time multiplexed downlink transmissions

7.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.2.4.1-1.

Table 7.5.1.2.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.1.2-1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.2.4.1-2

Table 7.5.1.2.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell 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.1.2, 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 7.5.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.4.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell are given in Table 7.5.1.2.4.1-3

2. Message contents are defined in clause 7.5.1.2.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.2.4.1-3: General test parameters for FR2 in-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.1 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.5 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 1.88 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.84 |
| D1 | | | s | 3.8 |
| 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. | | | | |

7.5.1.2.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.2.4.1-3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.2.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ([1120] ms 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. 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.

7.5.1.2.4.3 Message Contents

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

Table 7.5.1.2.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED  Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)  Table H.3.1-4 with A3-offset = 0  Table H.3.1-6 with Condition RLM  Table H.3.1-7  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.3 |

Table 7.5.1.2.4.3-2: Void

Table 7.5.1.2.4.3-3: *RLF-TimersAndConstant*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms4000 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

Table 7.5.1.2.4.3-4: Void

7.5.1.2.5 Test Requirement

Table 7.5.1.2.4.1-3 and 7.5.1.2.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

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%.

Table 7.5.1.2.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 3 defined in A.9.3 | | | | | | | | | |
|  | |  | **AoA1** | | | | | **AoA2** | | | | |
| Assumption for UE beams Note 5 | |  | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |  | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 4.1Note 6 | -3.9Note 6 | -15 | -4.5 | 4.1Note 6 |  | | | | |
| ssb-Index 1 SNR | Config 1 |  | Not sent | | | | | 4.1Note 6 | -15 | -15 | -15 | -15 |
|  | Config 1 | dBm/ 15kHz | -94.8 | | | | | -94.8 | | | | |
| Time multiplexing of the downlink transmissions from each AoA | |  | Defined in Figure 7.5.1.2.4-2 | | | | | | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that 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 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 38.133 [6] A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | | | | | |

#### 7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

7.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.3.

7.5.1.3.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table 7.5.1.3.4.1-1. The test parameters are given in Tables 7.5.1.3.4.1-3 and 7.5.1.3.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.3.4-1 shows the variation of the downlink SNR in the active cell 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. 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.

Chart, box and whisker chart

Description automatically generated

Figure 7.5.1.3.4-1: SNR variation for out-of-sync testing

7.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.3.4.1-1.

Table 7.5.1.3.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.1.3-1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.3.4.1-2

Table 7.5.1.3.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell 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.1.2, 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 7.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.4.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell are given in Table 7.5.1.3.4.1-3

2. Message contents are defined in clause 7.5.1.3.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.3.4.1-3: General test parameters for FR2 out-of-sync testing in DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 66 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.4 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 14.48 |
| T3 | | | s | 14.48 |
| D1 | | | s | 14.44 |
| 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. | | | | |

7.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.3.4.1-3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.3.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.3.5-1. T3 starts.

5. If the SS:  
  
a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and  
  
b) does not detect any uplink power from time point C ([240] ms 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 7.5.1.3.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.5.1.3.4.3 Message Contents

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

Table 7.5.1.3.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

|  |  |
| --- | --- |
| 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.3.1-7  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM  Table H.3.7-1 with condition DRX.3  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.5.1.3.4.3-1: Void

Table 7.5.1.3.4.3-2: UE-TimersAndConstants

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-200 | | | |
| Information Element | Value/remark | Comment | Condition |
| UE-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| t311 | ms1000 |  |  |
| n311 | n1 |  |  |
| } |  |  |  |

Table 7.5.1.3.4.3-3: Void

7.5.1.3.5 Test Requirement

Table 7.5.1.3.4.1-3 and 7.5.1.3.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

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

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

The UE shall stop transmitting uplink signal 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 7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| AoA setup | |  | Setup 1 defined in A.9.1 | | |
| Assumption for UE beams Note 5 | |  | Rough | | |
| 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 |  | | |
| ssb-Index 0 SNR | Config 1 | dB | 3.3Note 6 | -4.7Note 6 | -15.4 |
| ssb-Index 1 SNR | Config 1 | 3.3Note 6 | -15.4 | -15.4 |
|  | Config 1 | dBm/15KHz | -104.7dBm | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | |
| 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 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 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 A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | |

#### 7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

7.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.4.

7.5.1.4.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables 7.5.1.4.4.1-3 and 7.5.1.4.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.4.4-1 shows the variation of the downlink SNR in the active cell 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. 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.

Chart, box and whisker chart

Description automatically generated

Figure 7.5.1.4.4-1: SNR variation for in-sync testing

7.5.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.4.4.1-1.

Table 7.5.1.4.4.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.1.4-1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.4.4.1-2

Table 7.5.1.4.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell 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.1.2, 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 7.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.4.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell are given in Table 7.5.1.4.4.1-3

2. Message contents are defined in clause 7.5.1.4.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.4.4.1-3: General test parameters for FR2 in-sync testing in DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 66 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.1 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.11 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 2.8 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.88 |
| D1 | | | s | 3.84 |
| 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. | | | | |

7.5.1.4.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.4.4.1-3.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.4.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.4.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.4.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ([1120] ms 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. 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.

7.5.1.4.4.3 Message Contents

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

Table 7.5.1.4.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

|  |  |
| --- | --- |
| 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.3.1-7  Table H.3.5-4  Table H.3.5-9 with Condition SSB RLM  Table H.3.7-1 with condition DRX.3  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.5.1.4.4.3-2: Void

Table 7.5.1.4.4.3-3: *RLF-TimersAndConstant*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms4000 |  |  |
| n310 | n1 |  |  |
| n311 | n1 |  |  |
| t311-v1530 | ms1000 |  |  |
| } |  |  |  |

Table 7.5.1.4.4.3-4: Void

7.5.1.4.5 Test Requirement

Table 7.5.1.4.4.1-3 and 7.5.1.4.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

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%.

Table 7.5.1.4.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 5 | |  | Rough | | | | |
| 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 |  | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 3.3Note 6 | -4.7Note 6 | -15.4 | -4.9 | 3.3Note 6 |
| ssb-Index 1 SNR | Config 1 | 3.3Note 6 | -15.4 | -15.4 | -15.4 | -15.4 |
|  | Config 1 | dBm/15KHz | -104.7dBm | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 signal contains PDCCH for UEs other than the device under test as part of OCNG.3  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: 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 A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | |

#### 7.5.1.5 to 7.5.1.8

#### 7.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test tolerances and test system uncertainties applicable to this test are undefined.

- Message content is TBD

7.5.1.9.1 Test purpose

The purpose of this test is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1.7, and to verify that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

7.5.1.9.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

This test is only applicable to UE which supports *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

7.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.9.

7.5.1.9.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of one time period with time duration of T1. Figure 5.5.1.9.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.



Figure 7.5.1.9.4-1: Time multiplexed downlink transmissions

7.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.1.9.4.1-1.

Table 7.5.1.9.4.1-1: Supported test configurations for NR SA FR2 radio link monitoring UE scheduling restrictions

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.1.9-1 | 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.9.4.1-2

Table 7.5.1.9.4.1-2: Initial conditions for NR SA FR2 radio link monitoring UE scheduling restrictions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, 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 7.5.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.4.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell are given in Table 7.5.1.9.4.1-3

2. Message contents are defined in clause 7.5.1.9.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.9.4.1-3: General test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| RF Channel Number |  | 1 | 1 |  |
| SSB configuration |  | 1 | SSB.1 FR2 |  |
| SMTC configuration |  | 1 | SMTC pattern 1 |  |
| DRX cycle length | s | 1 | OFF |  |
| T1 | s | 1 | 5 | During T1 the UE is required to correctly transmit ACK/NACK |

7.5.1.9.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Set the parameters according to T1 in Table 7.5.1.9.4.4-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

2. If the SS receives ACK/NACK on each UL transmission occasion scheduled by PDCCH which are not overlapped with SSBs configured for radio link monitoring during T1, the number of successful tests is increased by one. otherwise the number of failed tests is increased by one.

3. The UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

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

7.5.1.9.4.3 Message Contents

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

Table 7.5.1.9.4.3-1: Common Exception messages for NR SA FR2 radio link monitoring UE scheduling restrictions

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | TBD |
| Default RRC messages and information elements contents exceptions | TBD |

7.5.1.9.5 Test Requirement

Table 7.5.1.9.4.1-3 and 7.5.1.9.5-1 define the primary level settings including test tolerances for NR SA FR2 radio link monitoring UE scheduling restrictions.

Table 7.5.1.9.5-1: Cell specific test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
| AoA setup |  | 1 | Setup 3 defined in A.9.3 | |
| AoA1 | AoA2 |
| Assumption for UE beams Note 1 |  |  | Rough | Rough |
| TDD configuration |  | 1 | TDDConf.3.1 | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1 | 24 | |
| PDSCH Reference measurement channel |  | 1 | SR.3.2 TDD | Not sent |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | Not sent |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.2 TDD | Not sent |
| TRS configuration |  | 1 | TRS.2.1 TDD | TRS.2.2 TDD |
| PDCCH/PDSCH TCI state |  | 1 | TCI.State.2 | N/A |
| OCNG Pattern |  | 1 | OP.5 | Not sent |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | |
| RLM-RS |  | 1 | SSB with index 0 | SSB with index 1 |
|  | dBm/15kHz | 1 | -92.1 | -92.1 |
| Note2 | dBm/SCS | 1 | -83.1 | -83.1 |
|  | dB | 1 | 2 | 2 |
| BB Note 4 | dB | 1 | 1 | 1 |
| SSB\_RP Note3 | dBm/SCS | 1 | -81.1 | -81.1 |
| Io | dBm/95.04 MHz | 1 | -54.35 | -54.35 |
| Time multiplexing of the downlink transmissions from each AoA | | 1 | Defined in Figure 7.5.1.9.4-1 | |
| Propagation Condition |  | 1 | AWGN | AWGN |
| Note 1: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3 and does not limit UE implementation or test system implementation.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | |

The UE behaviour during time duration T1 follows the requirements defined in TS 38.133 [6] clause 8.1.7.3:

The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

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%.

### 7.5.2 Interruption

#### 7.5.2.0 Minimum conformance requirements

##### 7.5.2.0.1 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS38.133, 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 7.5.2.0.1-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 7.5.2.0.1-2 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 7.5.2.0.1-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 7.5.2.0.1-2 if the active SCell is in the same band as the deactivated SCell.

[TS38.133, clause 8.2.2.2.2]

Table 7.5.2.0.1-1: Interruption duration for SCell activation/deactivation for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | |
| 0 | 1 |  | 1 |
| 1 | 0.5 |  | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 |
|  |  | Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 |
|  |  | Aggressor cell is on FR1 | 5 |
| 5 | 0.03125 | Aggressor cell is on FR1 | 17 |
| 6 | 0.015625 | Aggressor cell is on FR1 | 33 |

Table 7.5.2.0.1-2: Interruption duration for SCell activation/deactivation for intra-band CA

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length (slots) |
| 0 | 1 | 1 + TSMTC\_duration \* |
| 1 | 0.5 | 1 + TSMTC\_duration \* |
| 2 | 0.25 | 2 + TSMTC\_duration \* |
| 3 | 0.125 | 4 + TSMTC\_duration \* |
| 5 | 0.03125 | 16+ TSMTC\_duration \* |
| 6 | 0.015625 | 32+ TSMTC\_duration \* |
| NOTE 1: TSMTC\_duration measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, TSMTC duration for the SCell being activated is 0ms; - the longest SMTC duration among all active servingNOTE 2: is as defined in TS 38.211 [6]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

#### 7.5.2.1 NR SA FR2 interruptions during measurements on deactivated NR SCC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 7.5.2.0. Supported test configurations are shown in table 7.5.2.1.4.1-1.

7.5.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SA FR2 and 2DL CA.

7.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.2.1.

7.5.2.1.4 Test description

7.5.2.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.2.1.4.1-1.

Table 7.5.2.1.4.1-1: Supported test configurations for NR SA FR2 interruptions during measurements on deactivated NR SCC

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.2.1.4.1-2.

Table 7.5.2.1.4.1-2: Initial conditions for NR SA FR2 interruptions during measurements on deactivated NR SCC

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.2.1.4.1-3.

2. Message contents are defined in clause 7.5.2.1.4.3.

3. There are two NR cells specified in the test. Cell 1 is the PCell on one NR carrier and Cell 2 is the SCell on the other NR carrier. Cell 1 and Cell 2 shall be initially configured according to annex C.

Table 7.5.2.1.4.1-3: General test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | Two NR RF channels |
| Active PCell |  | Cell1 | PCell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell2 | Deactivated SCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell2 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

7.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is NR PCell and Cell2 is the 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 and fully synchronized to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1 the UE shall be continuously scheduled on the NR PCell DL.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 7.5.2.1.4.3.

2. Set the parameters according to values in Table 7.5.2.1.4.1-3 as appropriate. Propagation conditions are set according to clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 7.5.2.1.5-1 and Table 7.5.2.1.5-2. Propagation conditions are set according to clause C.2.2.

6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PCell.

7. 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”.

8. If no longer than X consecutive DTXs are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”, where,

- X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. After the RRC connection release, the SS shall:

9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE, and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b.

or

9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 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.

7.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.2.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Specific message contents exceptions for Test Configuration 7.5.2.1-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2 |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1;  Table H.3.1-2 with Condition Deactivated SCell;  Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1;  Table H.3.1-4 with A3-offset = -6dB;  Table H.3.1-7 with Condition Deactivated SCell; |

7.5.2.1.5 Test requirement

Table 7.5.2.1.5-1 and Table 7.5.2.1.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC.

Table 7.5.2.1.5-1: NR cell specific test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell1 | Cell2 |
| Frequency Range | |  | FR2 | |
| Duplex mode |  |  | TDD | |
| TDD configuration |  |  | TDDConf.3.1 | |
| BWchannel |  |  | 100 MHz: NRB,c = 66 | |
| Data RBs allocated |  |  | 66 | |
| Initial DL BWP Configuration |  |  | DLBWP.0.2Note4 | |
| Initial UL BWP Configuration |  |  | ULBWP.0.2 Note6 | |
| Downlink dedicated BWP Configuration |  |  | DLBWP.1.1 | |
| Uplink dedicated BWP configuration |  |  | ULBWP.1.1 | |
| PDSCH Reference measurement channel |  |  | SR.3.1 TDD | |
| RMSI CORESET parameters |  |  | CR.3.1 TDD | |
| Dedicated CORESET parameters |  |  | CCR.3.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SMTC Configuration | |  | SMTC.1 | |
| SSB Configuration |  |  | SSB.1 FR2 | |
| TCI State |  |  | TCI.State.0 | |
| TRS Configuration |  |  | TRS.2.1 TDD | |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  |
| Time offset to Cell1 Note 3 | | μs | - | 3 |
| Propagation Condition | |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: 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 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3]. | | | | |

Table 7.5.2.1.5-2: NR cell specific OTA related test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 |
| Angle of arrival configuration | |  | Setup1 according to table A.9 | Setup 1according to table A.9 |
| Assumption for UE beams Note 6 | |  | Rough | Rough |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -104.7 | -104.7 |
|  | NR\_TDD\_FR2\_B |  |  |  |
|  | NR\_TDD\_FR2\_F |  |  |  |
|  | NR\_TDD\_FR2\_G |  |  |  |
|  | NR\_TDD\_FR2\_T |  |  |  |
|  | NR\_TDD\_FR2\_Y |  |  |  |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCS | -95.7 | -95.7 |
|  | NR\_TDD\_FR2\_B |  |  |  |
|  | NR\_TDD\_FR2\_F |  |  |  |
|  | NR\_TDD\_FR2\_G |  |  |  |
|  | NR\_TDD\_FR2\_T |  |  |  |
|  | NR\_TDD\_FR2\_Y |  |  |  |
| SSB\_RPNote2 | NR\_TDD\_FR2\_A | dBm/120KHz Note3 | -88.7 | -88.7 |
|  | NR\_TDD\_FR2\_B |  |  |  |
|  | NR\_TDD\_FR2\_F |  |  |  |
|  | NR\_TDD\_FR2\_G |  |  |  |
|  | NR\_TDD\_FR2\_T |  |  |  |
|  | NR\_TDD\_FR2\_Y |  |  |  |
|  |  | dB | 7 | 7 |
|  | | dB | 7 | 7 |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -58.92 | -58.92 |
|  | NR\_TDD\_FR2\_B |  |  |  |
|  | NR\_TDD\_FR2\_F |  |  |  |
|  | NR\_TDD\_FR2\_G |  |  |  |
|  | NR\_TDD\_FR2\_T |  |  |  |
|  | NR\_TDD\_FR2\_Y |  |  |  |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation. | | | | |

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table 7.5.2.1.5-3.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table 7.5.2.1.5-4.

Table 7.5.2.1.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 4 |

Table 7.5.2.1.5-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 8 + SMTC duration |

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

### 7.5.3 SCell activation and deactivation delay

#### 7.5.3.0 Minimum conformance requirements

##### 7.5.3.0.1 Minimum conformance requirements for SCell activation delay for deactivated SCell

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot , where:



THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]

Tactivation\_time is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, Tactivation\_time is:

- TFirstSSB+ 5ms, if the SCell measurement cycle is equal to or smaller than 160ms.

- TFirstSSB\_MAX + Trs + 5ms, if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition Ês/Iot ≥ -2 dB is fulfilled, Tactivation\_time is:

- TFirstSSB\_MAX + TSMTC\_MAX + 2\*Trs + 5ms.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then Tactivation\_time is TFirstSSB+ 5ms provided:

- The UE is provided with SMTC for the target SCell, and

- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in TS 38.133 [6] clause 3.6.3,

- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, Tactivation\_time is 3 ms, 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 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then Tactivation\_time is:

- 3ms + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP), where Tuncertainty\_MAC=0 and Tuncertainty\_SP=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then Tactivation\_time is:

- max (Tuncertainty\_MAC + 5ms + TFineTiming, Tuncertainty\_RRC + TRRC\_delay-THARQ), where Tuncertainty\_MAC=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 6ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + THARQ + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP).

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}.

Where,

TSMTC\_MAX:

- In FR1, in case of intra-band SCell activation, TSMTC\_MAX is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, TSMTC\_MAX is the SMTC periodicity of SCell being activated.

- In FR2, TSMTC\_MAX is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- TSMTC\_MAX is bounded to a minimum value of 10ms.

Trs is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves Trs is applied with Trs = 5ms assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms

TFirstSSB: is the time to the end of the first completed SSB burst indicated by the SMTC after slot n +

TFirstSSB\_MAX: Is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + , further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.

- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

TFineTiming is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

TL1-RSRP, measure is L1-RSRP measurement delay TL1-RSRP\_Measurement\_Period\_SSB (ms)or TL1-RSRP\_Measurement\_Period\_CSI-RS based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

TL1-RSRP, report is delay of acquiring CSI reporting resources.

Tuncertainty\_MAC is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

Tuncertainty\_RRC is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

TRRC\_delay is the RRC procedure delay as specified in TS 38.331 [13].

Longer dekays 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.

TCSI\_reporting is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max (5\*measCycleSCell, 5\*DRX cycles) for FR1 before the reception of the SCell activation command:

- the UE has sent a valid measurement report for the SCell being activated and

- the SSB measured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

- the SSB measured during the period equal to max (5\*measCycleSCell, 5\*DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):

- the UE has sent a valid L3-RSRP measurement report with SSB index

- SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation

- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*prior to the activation command, TSMTC\_Scell follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. TSMTC\_MAX follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot n+1+ and not occur after slot n+1*+*.



The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot n+1+ and not occur after slot n+1+.



Starting from the slot specified in TS 38.213 [8] clause 4.3 (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 TS 38.213 [8] clause 4.3 (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.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

##### 7.5.3.0.2 Minimum conformance requirements for SCell deactivation delay for activated SCell

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot *n+*.



The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot n+1+[] and not occur after slot n+1+.



The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot n+1+[] and not occur after slot n+1+.



The normative reference for this requirement is TS 38.133 [6] clause 8.3.3.

#### 7.5.3.1 NR SA FR2-FR2 intra-band SCell activation and deactivation delay

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram

- Message contents are not complete.

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.3.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell and SCell are is in FR2 intra-band and SCell is known by the UE at the time of activation.

7.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.1.

7.5.3.1.4 Test description

7.5.3.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.1.4.1-1.

Table 7.5.3.1.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.3.1-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.1.4.1-2.

Table 7.5.3.1.4.1-2: Initial conditions for NR SA FR2 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | TBD |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.3.1.4.1-3.

2. Message contents are defined in clause 7.5.3.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.1.4.1-3: General test parameters for NR SA FR2 SCell activation case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1,2 | Two NR radio channels are used for this test, cell 1 and cell2 use RF channel 1 and 2, respectively. |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell2 timing offset to cell1 | μs | 0 |  |
| Time alignment error between cell2 and cell1 | μs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| THARQ | slot | k | k 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] depends on UE’s capability |
| TCSI\_Reporting | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]. |

7.5.3.1.4.2 Test procedure

TBD

7.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.3.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

7.5.3.1.5 Test requirement

TBD

#### 7.5.3.2 NR SA FR1-FR2 inter-band SCell activation and deactivation delay

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram

- Message contents are not complete.

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

- NR FR1 - FR2 OTA testability is still FFS.

7.5.3.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell is in FR1 and SCell is in FR2 and SCell is known by the UE at the time of activation.

7.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.2.

7.5.3.2.4 Test description

7.5.3.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.2.4.1-1.

Table 7.5.3.2.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.3.2-1 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode  Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.5.3.2-2 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode  Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.5.3.2-3 | PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.2.4.1-2.

Table 7.5.3.2.4.1-2: Initial conditions for NR SA FR2 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | TBD |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.3.2.4.1-3.

2. Message contents are defined in clause 7.5.3.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.2.4.1-3: General test parameters for NR SA FR2 SCell activation case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell2 timing offset to cell1 | μs | 0 |  |
| Time alignment error between cell2 and cell1 | 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 | 2 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| THARQ | slot | k | k 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] depends on UE’s capability |
| TCSI\_Reporting | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]. |

7.5.3.2.4.2 Test procedure

TBD

7.5.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.3.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

7.5.3.2.5 Test requirement

TBD

#### 7.5.3.3 SCell Activation and deactivation for SCell in FR2 inter-band in non-DRX

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

7.5.3.3.1 Test purpose

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause specified in TS 38.133 [6] clause 8.3, when the PCell and SCell are in FR2 inter-band and SCell in FR2 is known by the UE at the time of activation.

7.5.3.3.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting 5GS NR SA FR2 and 2DL CA.

7.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.3.

7.5.3.3.4 Test description

7.5.3.3.4.1 Initial conditions

The supported test configurations are shown in table 7.5.3.3.4.1-1. The general test parameters are described in Tables 7.5.3.3.4.1-3, and cell specific test parameters are described in Tables 7.5.3.3.4.1-4. OTA related test parameters are shown in table 7.5.3.3.4.1-5.

Table 7.5.3.3.4.1-1: Supported test configurations for FR2 SCell activation in FR2 inter-band

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.3.4.1-2.

Table 7.5.3.3.4.1-2: Initial conditions for NR SA FR2 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.3 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.3.3.4.1-3.

2. Message contents are defined in clause 7.5.3.3.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.3.4.1-3: General test parameters for FR2 SCell activation in FR2 inter-band

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1,2 | Two NR radio channels are used for this test. RF channel number 1 is in band 1 and RF channel number 2 is in band 2, where bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2. |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index |  | 0 | CQI reporting for SCell every second subframe |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell2 timing offset to cell1 | μs | ≤8 | A random value from 0μs to 8μs |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured and detected. |
| T2 | s | 2 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| THARQ | ms | k1NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [3] depends on UE’s capability |
| TCSI\_Reporting | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2] |

7.5.3.3.4.2 Test procedure

The test consists of three successive time periods, with duration T1, T2 and T3 respectively. Before the test starts the UE is connected to Cell 1 but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of Cell 2 is increased to same level as for cell 2. During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot m+TL1-RSRP. In the next DL slot after slot m+TL1-RSRP, the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, 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 7.5.3.3.4.1-3 and 7.5.3.3.4.1-4. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

4. The UE sends a *MeasurementReport* message.

5. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

6. 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 n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 7, otherwise go to step 10.

7. 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 PCell according to the following criteria:

- If the UE starts sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+TL1-RSRP), where TL1-RSRP is no larger than

3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report as defined in TS 38.133 [6] clause 8.3.2.

For this test case, TFirstSSB\_MAX=TSMTC\_MAX=Trs=20ms; TL1-RSRP, measure=480ms and TL1-RSRP, report=5ms, which allows TL1-RSRP 1000 ms.

- and CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot , where THARQ is defined in Table A.5.5.3.1.1-2

Tactivation\_time = 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}, which allows 1030 ms

TCSI\_Reporting = 10ms

NR slot length is 0.125ms for this test case.

- and the interruption of PCell during SCell activation shall not happen outside the slot to , where TX =20ms.

- 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 10.

8. 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 m and T3 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 9, otherwise go to step 10.

9. The UE shall stop sending CSI reports for SCell no later than slot , as defined in clause 8.3 and the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot to as defined in clause 8.3. If both conditions are met, then the number of successes for the event “Deactivation” is increased by one. Otherwise, count a fail for the event “Deactivation”.

10. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 7, or Deactivation in step 8 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

12. After the RRC connection release, the SS:  
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat steps 2-12 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.

7.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL\_CSI\_ON\_SPCELL with the following exceptions:

Table 7.5.3.3.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell;  Table H.3.1-1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.5.3.3.4.3-2: *RRCReconfiguration*: 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 | Table 7.5.3.3.4.3-2A |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| masterCellGroup | | CellGroupConfig-SCell | Table 7.5.3.3.4.3-5 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.5.3.3.4.3-2A: MeasConfig (Table 7.5.3.3.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.5.3.3.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | ReportConfigId |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 7.5.3.3.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.3.4.3-3: 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 7.5.3.3.4.3-4: 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 7.5.3.3.4.3-5: CellGroupConfig-SCell (Table 7.5.3.3.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | Not present | PCell always uses servCellIndex=0 |  |
| reconfigurationWithSync | Not present |  |  |
| rlf-TimersAndConstants | Not present |  |  |
| rlmInSyncOutOfSyncThreshold | Not present |  |  |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.3.4.3-6 |  |
| } |  |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.3.4.3-7 |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.3.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.3.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.5.3.3.4.3-7: ServingCellConfig-SCell (Table 7.5.3.3.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |

7.5.3.3.5 Test requirement

During T2 the UE shall start sending CSI report for the SCell in the configured slots for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k). UE shall send the first CSI report for SCell after receiving at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k), or in the next available uplink resource for CSI reporting if the slot was subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2, the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+TL1-RSRP), where TL1-RSRP is no larger than 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report as defined in clause 8.3.2. For this test case, TFirstSSB\_MAX=TSMTC\_MAX=Trs=20ms; TL1-RSRP, measure=480ms and TL1-RSRP, report=5ms, which allows TL1-RSRP =1000ms.

During T2, the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot , where

- THARQ is defined in Table A.7.5.3.3.1-2 of TS 38.133 [6]

- Tactivation\_time = 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}, which allows 1030ms

- TCSI\_Reporting = 10ms

- NR slot length is 0.125ms for this test case.

During T2, the interruption of PCell during SCell activation shall not happen outside the slot to , where TX =20ms.

During T3, the UE shall stop sending CSI reports for SCell no later than slot , as defined in TS 38.133 [6] clause 8.3.

During T3, the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot to as defined in clause 8.3.

Table 7.5.3.3.5-1: Cell specific test parameters for FR2 SCell activation in FR2 inter-band

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ParameterNote 5 | Unit | T1 | | T2 | | T3 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN |  | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode |  | TDD | | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| Downlink initial BWP Configuration |  | DLBWP.0.1 | | DLBWP.0.1 | | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration |  | DLBWP.1.1 | | DLBWP.1.1 | | DLBWP.1.1 | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | ULBWP.0.1 | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | ULBWP.1.1 | | ULBWP.1.1 | |
| TRS configuration |  | TRS.2.1 TDD | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| TCI state |  | TCI.State.0 | | TCI.State.0 | | TCI.State.0 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Parameters |  | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Parameters |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| CSI-RS configuration |  | NA | NA | NA | CSI-RS.3.1 TDD Note 2 | NA | CSI-RS.3.1 TDD |
| CSI reporting periodicity Note 3 |  | NA | 5 | NA | 5 | NA | 5 |
| OCNG Patterns |  | OP.1 | | | | | |
| SSB Configuration |  | SSB.1 FR2 | | | | | |
| SMTC Configuration |  | SMTC.1 | | | | | |
| 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\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | 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: CSI-RS for CSI measurement is (re)configured in the next DL slot after slot m+TL1-RSRP during T2.  Note 3: L1-RSRP measurement and reporting are configured to the the UE prior to the start of time period T1. | | | | | | | |

Table 7.5.3.3.5-2: OTA related test parameters for FR2 SCell activation in FR2 inter-band

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ParameterNote 6 | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup |  | Setup 3 as specified in clause A.9.3 | | | | | |
| **AoA1** | | | **AoA2** | | |
| Assumption for UE beams Note 7 |  | Rough | | | Rough | | |
| Note1 | dBm/15kHzNote4 | -92.1 + TT | | | -92.1 + TT | | |
| Note1 | dBm/SCSNote3 | -83.1 + TT | | | -83.1 + TT | | |
|  | dB | 0 + TT | | | 0 + TT | | |
| SS-RSRPNote2 | dBm/SCS Note4 | -83.1 + TT | | | -83.1 + TT | | |
|  | dB | 0 + TT | | | 0 + TT | | |
| IoNote2 | dBm/95.04 MHz Note4 | -51.1 + TT | | | -51.1 + TT | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: All parameters apply for configuration 1  Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | |

#### 7.5.3.4 Direct SCell activation at SCell addition of known SCell in FR2

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Measurement uncertainty are missing

7.5.3.4.1 Test Purpose

The purpose of this test is to verify that the delay and interruption for direct SCell activation delay at SCell addition are within the requirements stated in TS 38.133 [6] clause 8.3.4.

7.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting 2DL CA and direct SCell activation.

7.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.4.

7.5.3.4.4 Test description

7.5.3.4.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.4.4.1-1.

Table 7.5.3.4.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.3.4-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.4.4.1-2 and Table 7.5.3.4.4.1-3.

Table 7.5.3.4.4.1-2: Initial conditions for NR SA FR2 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | - Without LTE link | |  |

Table 7.5.3.4.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1,2 | Two NR radio channels (1,2) in FR2 are used for this test |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured and activated SCell |  | Cell 2 | Configured and activated SCell on NR RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| T1 | s | 7 | During this time the measurement for Cell 2 is configured, and Cell 2 is detected. |
| T2 | s | Ndirect | During this time the UE shall configure and activate Cell 2 as SCell. |
| T3 | ms | 100 | During this time the UE shall report valid CQI for both PCell and SCell. |
| THARQ | ms | k1\*NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] |
| k | ms |  | As specified in clause 4.3 of TS38.213 [8] |

1.The general test parameter settings are set up according to Table 7.5.3.4.4.1-3.

2. Message contents are defined in clause 7.5.3.4.4.3.

3. There are 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

7.5.3.4.4.2 Test Procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two FR2 carriers and two NR cells. Before the test starts the UE is connected to Cell 1 (PCell) on carrier #1, but is not aware of Cell 2 on NR carrier #2. Cell 1 and Cell 2 have constant signal levels throughout the test. The UE is monitoring the PCell. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the Cell 2 is monitored by the UE. During T1, Cell 2 should be detected and measured by the UE such that it meets the condition for known cell defined in TS 38.133 [6] clause 8.3.4 for direct SCell activation.

Time period T2 starts when the *RRCReconfiguration* message for the configuration and activation of Cell 2 (the SCell), which is sent from the test equipment, is received at the UE antenna connector in a slot # denoted m. The test equipment shall set the parameter *sCellState* to *activated* for the SCell, which causes Cell 2 to become configured and activated.

Time period T3 starts at (m + Ndirect), at which point UE shall be reporting a valid CQI for both PCell and SCell.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during the activation of SCell. The test equipment verifies the activation time by counting the slots from the time when the SCell activation message is sent until a CQI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.5.3.4.4.1-3 and 7.5.3.4.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2..

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. After having received a measurement report containing Cell 2, the SS activates SCC by sending a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state as defined in message contents table 7.5.3.4.4.3-5.

6. The UE shall start reporting CSI in PSCell in slot (m+k+TRRC\_process), where TRRC\_process is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.4. UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot ,

- or slot if the slot was subject to interruption,

- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot ,

- or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot

- and DTX is not observed by the SS outside the slot to up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:  
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

7.5.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL\_CSI\_ON\_SPCELL with the following exceptions:

Table 7.5.3.4.4.3-1: 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.3.1-7 with Condition Deactivated SCell  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.5.3.4.4.3-2: *RRCReconfiguration*: 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 | Table 7.5.3.4.4.3-2A |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| masterCellGroup | | CellGroupConfig-SCell | Table 7.5.3.4.4.3-5 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.5.3.4.4.3-2A: MeasConfig (Table 7.5.3.4.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.5.3.4.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | ReportConfigId |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 7.5.3.4.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.4.4.3-3: 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 7.5.3.4.4.3-4: 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 7.5.3.4.4.3-5: CellGroupConfig-SCell (Table 7.5.3.4.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | Not present | PCell always uses servCellIndex=0 |  |
| reconfigurationWithSync | Not present |  |  |
| rlf-TimersAndConstants | Not present |  |  |
| rlmInSyncOutOfSyncThreshold | Not present |  |  |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.4.4.3-6 |  |
| } |  |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.4.4.3-7 |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| sCellState-r16 | activated |  |  |
| … |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.4.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.4.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.5.3.4.4.3-7: ServingCellConfig-SCell (Table 7.5.3.4.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |

7.5.3.4.5 Test requirement

Table 7.5.3.4.5-1 defines the cell specific test parameters and Table 7.5.3.4.5-2 defines OTA related test parameters.

Table 7.5.3.4.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PCell

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| SSB ARFCN | |  | freq1 | | | freq2 | | |
| Duplex mode | Config 1 |  | TDD | | | | | |
| TDD configuration | Config 1 |  | TDDConf.3.1 | | | | | |
| BWchannel | Config 1 | MHz | 100: NRB,c = 66 | | | | | |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 | | | | | |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | | | | | |
| Timing offset to Cell 1 | | ms | Not Applicable | | | 0 | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | Config 1 |  | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| TRS configuration | Config 1 |  | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| CSI-RS configuration | Config 1 |  | CSI-RS.3.1 TDD | | | CSI-RS.3.1 TDD | | |
| CSI reporting periodicity | Config 1 | ms | 5 | | | 5 | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC configuration | |  | SMTC.1 | | | | | |
| SSB configuration | Config 1 |  | SSB.1 FR2 | | | SSB.1 FR2 | | |
| 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) | |
| 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. | | | | | | | | |

Table 7.5.3.4.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ParameterNote 6 | Unit | Cell 1 | | | Cell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration |  | Setup 1 according to A.9.1 | | | | | |
| Assumption for UE beamsNote 7 |  | Rough | | | Rough | | |
| Note1 | dBm/15kHzNote4 | -112+TT | | | -112+TT | | |
| Note1 | dBm/SCSNote3 | -102.97+TT | | | -102.97+TT | | |
|  | dB | 14+TT | | | 14+TT | | |
| SS-RSRPNote2 | dBm/SCS Note4 | -88.97+TT | | | -88.97+TT | | |
|  | dB | 14+TT | | | 14+TT | | |
| IoNote2 | dBm/95.04 MHz Note4 | -59.81+TT | | | -59.81+TT | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: All parameters apply for configuration 1  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

The UE shall complete the direct activation of the SCell no later than at slot *m +* .

The UE shall report non-zero CQI for SCell from slot *m +*  and onwards throughout time period T3.

The interruption on PCell during direct activation of the SCell shall occur within the interruption window specified in TS 38.133 [6] clause 8.3.4 and shall not exceed the length specified in TS 38.133 [6] clause 8.2.2.2.11.

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

#### 7.5.3.5 Direct SCell activation at handover with known SCell in FR2

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Measurement uncertainty are missing

7.5.3.5.1 Test Purpose

This test is to verify the requirements specified in TS 38.133 [6] sub clause 8.3.5 for the FR2 handover with direct SCell activation.

7.5.3.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting 2DL CA and direct SCell activation.

7.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.5.

7.5.3.5.4 Test description

7.5.3.5.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.5.4.1-1.

Table 7.5.3.5.4.1-1: Supported test configurations for FR2 handover with direct SCell activation case

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.3.5-1 | SCell: NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode  Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.5.4.1-2 and Table 7.5.3.5.4.1-3.

Table 7.5.3.5.4.1-2: Initial conditions for NR SA FR2 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | - Without LTE link | |  |

Table 7.5.3.5.4.1-3: General test parameters for FR2 handover with direct SCell activation case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2, 3 | Three NR radio channels are used for this test, Cell 1, Cell2 and Cell 3 use RF channel 1, 2 and 3 respectively. |
| A4-Offset | | dBm | -120 |  |
| Time offset between cells | |  | 3 ms | Synchronous cells |
| Initial conditions | Source cell |  | Cell 1 | Source Cell |
| Target cell |  | Cell 2 | Neighbour cell |
| SCell |  | Cell 3 | SCell is not added and activated |
| Final condition | Source cell |  | Cell 2 | Cell 2 is Source cell after handover |
| Neighbour cell |  | Cell 1 | Neighbour cell |
| SCell |  | Cell 3 | SCell is added and activated |

1.The general test parameter settings are set up according to Table 7.5.3.5.4.1-3.

2. Message contents are defined in clause 7.5.3.5.4.3.

3. There are 3 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

7.5.3.5.4.2 Test procedure

The test scenario comprises of three FR2 cells, one source PCell (Cell 1), one target PCell (Cell 2) and one SCell (Cell 3). The test consists of three successive time periods, with time durations of T1, T2, and T3 respectively.

At the start of time duration T1, the UE is in connected mode with PCell (Cell 1). Both Cell 2 and Cell 3 are known to UE and UE is reporting CQI for all Cell 1.

Time period T2 starts when UE receives a handover command that initiate handover of UE to Cell2 and also activates Cell 3. This is done using an *RRCConnectionReconfiguration* message with parameter *sCellState* set to *activated* for the Cell 3. The message is sent from the test equipment to the UE and is received in a slot number n at the UE antenna connector. The UE shall accomplish the handover, addition and activation of the SCell no later than slot (n +).

Time period T3 starts at (n +), at which point UE shall be reporting a valid CSI for both Cell 2 and Cell 3 as given in tables 7.5.3.5.5-1 and 7.5.3.5.5-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message

2. Set the parameters according to T1 in Tables 7.5.3.5.5-1 and 7.5.3.5.5-2. 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 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. After having received a measurement report containing Cell 3, the SS activates SCC by sending a RRCReconfiguration message to the UE by which it configures the SCell (Cell 3) in activated state as defined in message contents table 7.5.3.5.4.3-5, (it also implies a handover to Cell 2).

6. The UE shall transmit the uplink PRACH channel to Cell 2 less than 62 ms from the beginning of time period T2. The UE shall start reporting CSI in PSCell in slot (m+k+ 1+Tinterrupt +TRRC\_process), where TRRC\_process is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.5. Tinterrupt is the interruption time during handover as specified in TS 38.133 [6] clause 6.1.1, T2 is the delay from slot until UE has obtained a valid TA command for the target PCell and T3 is the delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to k+1 slot, where k is defined in clause 4.2 in TS 38.213[8], UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot ,

- or slot if the slot was subject to interruption, where is the interruption length given in TS 38.133 [6] clause 8.2.

- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot ,

- or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot .

- and DTX is not observed by the SS outside the slot to up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008), and Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:  
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

7.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL\_CSI\_ON\_SPCELL with the following exceptions:

Table 7.5.3.5.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| **Default Message Contents** | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-7 with Condition Deactivated SCell  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1  Table H.3.2-2 with Condition RBConfig\_KeyChange |

Table 7.5.3.5.4.3-2: *RRCReconfiguration*: 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 | Table 7.5.3.5.4.3-2A |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| masterCellGroup | | CellGroupConfig-SCell | Table 7.5.3.5.4.3-5 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 7.5.3.5.4.3-2A: MeasConfig (Table 7.5.3.5.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7.5.3.5.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | ReportConfigId |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 7.5.3.5.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.5.4.3-3: MeasObjectNR for SCell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| measCycleSCell-v1530 | sf160 |  |  |
| } |  |  |  |

Table 7.5.3.5.4.3-4: ReportConfigNR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-4 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| eventTriggered SEQUENCE { |  |  |  |
| eventId CHOICE { |  |  |  |
| eventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -30 | To ensure reporting can always be triggered |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.5.4.3-5: CellGroupConfig-SCell (Table 7.5.3.5.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell\_add | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | Not present | PCell always uses servCellIndex=0 |  |
| reconfigurationWithSync | Not present |  |  |
| rlf-TimersAndConstants | Not present |  |  |
| rlmInSyncOutOfSyncThreshold | Not present |  |  |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.5.4.3-6 |  |
| } |  |  |  |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry |  |  |
| SCellConfig[1] SEQUENCE { |  | entry 1 |  |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.5.4.3-7 |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| sCellState-r16 | activated |  |  |
| … |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.3.5.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.5.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| servingCellMO | 1 |  |  |
| } |  |  |  |

Table 7.5.3.5.4.3-7: ServingCellConfig-SCell (Table 7.5.3.5.4.3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No\_UL | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| servingCellMO | 2 |  |  |
| } |  |  |  |



7.5.3.5.5 Test requirement

Table 7.5.3.5.5-1 defines the cell specific test parameters and Table 7.5.3.5.5-2 defines OTA related test parameters.

Table 7.5.3.5.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PCell

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ParameterNote 5 | Unit | T1 | | | T2 | | | T3 | | |
| Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 |
| SSB ARFCN |  | freq1 | freq2 | freq 3 | freq1 | freq2 | freq 3 | freq1 | freq2 | freq3 |
| Duplex mode |  | TDD | | | TDD | | | TDD | | |
| TDD configuration |  | TDDConf.3.1 | | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| Downlink initial BWP Configuration |  | DLBWP.0.1 | | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Downlink dedicated BWP Configuration |  | DLBWP.1.1 | | | DLBWP.1.1 | | | DLBWP.1.1 | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | | ULBWP.1.1 | | | ULBWP.1.1 | | |
| TRS configuration |  | TRS.2.1 TDD | | | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| TCI state |  | TCI.State.0 | | | TCI.State.0 | | | TCI.State.0 | | |
| BWchannel | MHz | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | | - | SR.3.1 TDD | | - | SR.3.1 TDD | |  |
| RMSI CORESET Parameters |  | CR.3.1 TDD | | - | CR.3.1 TDD | | - | CR.3.1 TDD | |  |
| Dedicated CORESET Parameters |  | CCR.3.1 TDD | | - | CCR.3.1 TDD | | - | CCR.3.1 TDD | |  |
| OCNG Patterns |  | OP.1 | | | | | | | | |
| SSB Configuration |  | SSB.1 FR2 | | | | | | | | |
| SMTC Configuration |  | SMTC.1 | | | | | | | | |
| PRACH configuration |  | FR2 PRACH configuration 1 | | | | | | | | |
| CSI-RS configuration for CSI reporting |  | CSI-RS.3.1 TDD | | | | | | | | |
| reportConfigType |  | periodic | | - | periodic | | - | periodic | | - |
| reportQuantity |  | cri-RI-PMI-CQI | | - | cri-RI-PMI-CQI | | - | cri-RI-PMI-CQI | | - |
| CSI reporting periodicity | slot | 40 | | - | 40 | | - | 40 | | - |
| CSI reporting offset | slot | 4 | | - | 4 | | - | 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\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | AWGN | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Void | | | | | | | | | | |

Table 7.5.3.5.5-2: OTA related test parameters for FR2 SCell activation case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ParameterNote 6** | **Unit** | **Cell 1** | | | **Cell 2** | | | **Cell 3** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Angle of arrival configuration |  | Setup 1 according to table A.9.1 | | | | | | | | |
| Assumption for UE beams Note 7 |  | Rough | | | Rough | | | Rough | | |
| Note1 | dBm/15kHzNote4 | -112+TT | | | -112+TT | | | -112+TT | | |
| Note1 | dBm/SCSNote3 | -102.97+TT | | | -102.97+TT | | | -102.97+TT | | |
|  | dB | 14+TT | | | 14+TT | | | 14+TT | | |
| SS-RSRPNote2 | dBm/SCS Note4 | -88.97+TT | | | -88.97+TT | | | -88.97+TT | | |
|  | dB | 14+TT | | | 14+TT | | | 14+TT | | |
| IoNote2 | dBm/95.04 MHz Note4 | -88.80+TT | | | -88.80+TT | | | -88.80+TT | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | | | | |

The UE shall be capable to transmit valid CSI report for PCell (Cell 2) and to the directly activated SCell1 no later than in slot n+ *Ndirect*.

The SCell activation delay, Ndirect, can be expressed as: Ndirect = TRRC\_process + Tinterrupt + T2 + T3 + Tactivation\_time + TCSI\_Reporting - 3ms; Where:

- TRRC\_Process: RRC procedure delay defined in clause 12 of TS 38.331 [13] and it is equal to 16ms,

- Tinterrupt: Interruption time during handover as specified in TS 38.133 [6] clause 6.1.1. The value to be verified in the test is 52 ms (Tinterrupt = 0 ms for Tsearch + 10ms for TIU + 20 ms for Tprocessing + 20ms for T∆ + 2 ms for Tmargin ms) by assuming known SCell and SMTC.1 configuration.

- T2: Delay from slot until UE has obtained a valid TA command for the target PCell,

- T3: Delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to k+1 slot, where k is defined in clause 4.2 in TS 38.213 [8],

- Tactivation\_timeand TCSI\_Reportingare specified in TS 38.133 clause 8.3.2 [6], where the following definitions of *TFirstSSB* and *TFirstSSB\_MAX* as defined in TS 38.133 [6] section 8.3.5 shall apply:

During time period T2 of the test, the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot , Tactivation\_time = TSMTC\_SCell + 5ms, as defined in TS 38.133 [6] clause 8.3.

During time period T3 of the test, the UE shall stop sending CSI reports for SCell at latest in a slot , as defined in TS 38.133 [6] clause 8.3.

During time period T2 of the test, interruption of PCell / PSCell during SCell activation shall not happen outside the slot to , as defined in TS 38.133 [6] clause 8.3.

During time period T3 of the test, the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot to , as defined in TS 38.133 [6] clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

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 time period T2 of the test, if there are no uplink resources for reporting the valid CSI in a slot as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.



### 7.5.4 Void

### 7.5.5 Link recovery procedures

#### 7.5.5.0 Minimum conformance requirements

##### 7.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.1.

##### 7.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.2.

##### 7.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 5.5.5.0.3.

##### 7.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 5.5.5.0.4.

#### 7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, 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 FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.1.

7.5.5.1.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.1.4-2 shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

文字と写真のスクリーンショット

自動的に生成された説明

Figure 7.5.5.1.4-1: SNR variation for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

グラフ

自動的に生成された説明

Figure 7.5.5.1.4-2: SSB\_RP level variation for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

7.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.1.4.1-1.

Table 7.5.5.1.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.1-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 7.5.5.1-2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.1.4.1-2.

Table 7.5.5.1.4.1-2: Initial conditions for NR SA FR2 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.5-1 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 7.5.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.1.4.1-3. The measurement gap configuration is according to Table 7.5.5.1.4.1-4.

2. Message contents are defined in clause 7.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.1.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1-2 |  | Cell 1 |  |
| RF Channel Number | | 1-2 |  | 1 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 | Table A.1.5-3 |
| BWchannel | | 1-2 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD | Table A.1.1.2-3 |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | Table A.1.2.2-3 |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD | Table A.1.3.2-3 |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 | Table A.2.1-1 |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 |  | SSB.1 FR2 | Table A.3.2-1 |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-2 |  | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 |  | OFF |  |
| SSB index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| SSB index assigned as RLM RS | | 1-2 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | gp0 |  |
| gapOffset | | 1-2 | ms | 0 |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109 Note 3 | Threshold used for Qin\_LR\_SSB |
| 2 | -106 Note 3 |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 2.61 |  |
| T3 | | 1-2 | s | 1.64 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 1.01 |  |
| D1 | | 1-2 | s | 0.97 |  |
| 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: Including test tolerance given in Annex F.1.3.2. | | | | | |

Table 7.5.5.1.4.1-4: Void

7.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 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 *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.1.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.1.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.1.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI 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 candidate beam set q1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.1.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.1.4.3 Message contents

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

Table 7.5.5.1.4.3-1: Common Exception messages for NR SA FR2 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.3.1-2 with condition INTER-FREQ and GAP NEEDED;  Table H.3.1-3 with condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)  Table H.3.1-4 with a3-offset = -6dB;  Table H.3.1-6 with condition gapUE and BFD.  Table H.3.1-8 with Condition SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A |

7.5.5.1.5 Test requirement

Tables 7.5.5.1.4.1-3 and 7.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.1.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| 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 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| Config 2 | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
|  | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.1.4-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE hich supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband  Note 12: Including test tolerance given in Annex F.1.3.2 | | | | | | | |

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 = 960+10 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%.

#### 7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, 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 FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.2.

7.5.5.2.4 Test description

There are one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.2.4-2 shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

文字と写真のスクリーンショット

自動的に生成された説明

Figure 7.5.5.2.4-1: SNR variation for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

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Figure 7.5.5.2.4-2: SSB\_RP level variation for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

7.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.2.4.1-1.

Table 7.5.5.2.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.2-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 7.5.5.2-2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.2.4.1-2.

Table 7.5.5.2.4.1-2: Initial conditions for NR SA FR2 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.5-1 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 7.5.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.2.4.1-3. The DRX configuration is according to Table 7.5.5.2.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.2.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1-2 |  | Cell 1 |  |
| RF Channel Number | | 1-2 |  | 1 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 | Table A.1.5-3 |
| BWchannel | | 1-2 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD | Table A.1.1.2-3 |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | Table A.1.2.2-3 |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD | Table A.1.3.2-3 |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 | Table A.2.1-1 |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 |  | SSB.1 FR2 | Table A.3.2-1 |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-2 |  | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 |  | DRX.3 | Table A.5-1 |
| SSB index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| SSB index assigned as RLM RS | | 1-2 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109 Note 3 | Threshold used for Qin\_LR\_SSB |
| 2 | -106 Note 3 |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 3.37 |  |
| T3 | | 1-2 | s | 2.8 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 0.61 |  |
| D1 | | 1-2 | s | 0.57 |  |
| 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: Including test tolerance given in Annex F.1.3.2 | | | | | |

Table 7.5.5.2.4.1-4: Void

7.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.2.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI 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 candidate beam set q1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.2.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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.

7.5.5.2.4.3 Message contents

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

Table 7.5.5.2.4.3-1: Common Exception messages for NR SA FR2 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.3.7-1 with condition DRX.3 |

7.5.5.2.5 Test requirement

Tables 7.5.5.2.4.1-3 and 7.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in DRX.

Table 7.5.5.2.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| 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 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| Config 2 | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
|  | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.2.4-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.  Note 12: Including test tolerance given in | | | | | | | |

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 = 560+10 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%.

#### 7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, 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 FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS-based RLM and link recovery .

7.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.3.

7.5.5.3.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.3.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

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Figure 7.5.5.3.4-1: SNR variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

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Figure 7.5.5.3.4-2: CSI-RS\_RP level variation for NR SA FR2 CSI-RS based beam failure detection and link recovery in non-DRX

7.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.3.4.1-1.

Table 7.5.5.3.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.3-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.3.4.1-2.

Table 7.5.5.3.4.1-2: Initial conditions for NR SA FR2 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.5-1 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 7.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.3.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.3.4.1-3.

2. Message contents are defined in clause 7.5.5.3.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.3.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1 |  | Cell 1 |  |
| RF Channel Number | | 1 |  | 1 |  |
| Duplex mode | | 1 |  | TDD |  |
| TDD Configuration | | 1 |  | TDDConf.3.1 | Table A.1.5-3 |
| BWchannel | | 1 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 |  |
| DL initial BWP configuration | | 1 |  | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1 |  | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1 |  | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1 |  | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD | Table A.1.1.2-3 |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | Table A.1.2.2-3 |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD | Table A.1.3.2-3 |
| OCNG parameters | | 1 |  | OP.1 | Table A.2.1-1 |
| CP length | | 1 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1 |  | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1 |  | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 |  | SSB.1 FR2 | Table A.3.2-1 |
| SMTC Configuration | | 1 |  | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1 |  | PRACH.4 FR2 | Table A.7.2-1 |
| DRX configuration | | 1 |  | OFF |  |
| CSI-RS configuration for BFD/CBD/RLM | | 1 |  | CSI-RS.3.2 TDD | Table A.1.4.2-3 |
| CSI-RS index assigned as BFD RS (q0) | | 1 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1 |  | 1 |  |
| CSI-RS index assigned as RLM RS | | 1 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1 |  | 1-0 |  |
| Number of Control OFDM symbols | 1 |  | 2 |  |
| Aggregation level | 1 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 |  |
| DMRS precoder granularity | 1 |  | REG bundle size |  |
| REG bundle size | 1 |  | 6 |  |
| Gap pattern ID | | 1 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1 |  | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109Note 2 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1 |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 |  | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1 |  | periodic |  |
| reportQuantity | | 1 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1 | slot | 40 |  |
| CSI reporting offset | | 1 | slot | 4 |  |
| T310 | | 1 | ms | 1000 |  |
| N310 | | 1 |  | 2 |  |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 1.17 |  |
| T3 | | 1 | s | 0.9 |  |
| T4 | | 1 | s | 0 |  |
| T5 | | 1 | s | 0.31 |  |
| D1 | | 1 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: Including test tolerance given in Annex F.1.3.2. | | | | | |

7.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. 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 *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.3.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect a preamble on a beam associated with candidate beam set q1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q1 beforetime 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. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.3.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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.

7.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.5.3.4.3-1: Common Exception messages for NR SA FR2 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 |

7.5.5.3.5 Test requirement

Tables 7.5.5.3.4.1-3 and 7.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.3.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| 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 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
|  | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.3.4-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.  Note 12: Including test tolerance given in Annex F.1.3.2. | | | | | | | |

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 =260+10 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%.

#### 7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, 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 FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and CSI-RS-based RLM and link recovery and long DRX cycle.

7.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.4.

7.5.5.4.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.4.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

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Figure 7.5.5.4.4-1: SNR variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

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Figure 7.5.5.4.4-2: CSI-RS\_RP level variation for NR SA FR2 CSI-RS based beam failure detection and link recovery in DRX

7.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.4.4.1-1.

Table 7.5.5.4.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.4-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.4.4.1-2.

Table 7.5.5.4.4.1-2: Initial conditions for NR SA FR2 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.5-1 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 6.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.4.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.4.4.1-3. The DRX configuration for is according to Table 7.5.5.4.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.4.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1 |  | Cell 1 |  |
| RF Channel Number | | 1 |  | 1 |  |
| Duplex mode | | 1 |  | TDD |  |
| TDD Configuration | | 1 |  | TDDConf.3.1 | Table A.1.5-3 |
| BWchannel | | 1 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 |  |
| DL initial BWP configuration | | 1 |  | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1 |  | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1 |  | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1 |  | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD | Table A.1.1.2-3 |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | Table A.1.2.2-3 |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD | Table A.1.3.2-3 |
| OCNG parameters | | 1 |  | OP.1 | Table A.2.1-1 |
| CP length | | 1 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1 |  | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1 |  | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 |  | SSB.1 FR2 | Table A.3.2-1 |
| SMTC Configuration | | 1 |  | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1 |  | PRACH.4 FR2 | Table A.7.2-1 |
| DRX configuration | | 1 |  | DRX.3 | Table A.5-1 |
| CSI-RS configuration for BFD/CBD/RLM | | 1 |  | CSI-RS.3.2 TDD | Table A.1.4.2-3 |
| CSI-RS index assigned as BFD RS (q0) | | 1 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1 |  | 1 |  |
| CSI-RS index assigned as RLM RS | | 1 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1 |  | 1-0 |  |
| Number of Control OFDM symbols | 1 |  | 2 |  |
| Aggregation level | 1 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 |  |
| DMRS precoder granularity | 1 |  | REG bundle size |  |
| REG bundle size | 1 |  | 6 |  |
| Gap pattern ID | | 1 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1 |  | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109Note 2 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1 |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 |  | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1 |  | periodic |  |
| reportQuantity | | 1 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1 | slot | 40 |  |
| CSI reporting offset | | 1 | slot | 4 |  |
| T310 | | 1 | ms | 1000 |  |
| N310 | | 1 |  | 2 |  |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 5.43 |  |
| T3 | | 1 | s | 5.16 |  |
| T4 | | 1 | s | 0 |  |
| T5 | | 1 | s | 0.31 |  |
| D1 | | 1 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: Including test tolerance given in Annex F.1.3.2 | | | | | |

Table 7.5.5.4.4.1-4: Void

7.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.4.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI 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 candidate beam set q1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.4.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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.

7.5.5.4.4.3 Message contents

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

Table 7.5.5.4.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD  Table H.3.1-10 with Condition CSI-RS  Table H.3.1-10A  Table H.3.7-1 with Condition DRX.3 |

7.5.5.4.5 Test requirement

Tables 7.5.5.4.4.1-3 and 7.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX.

Table 7.5.5.4.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| 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 | dB | 13.7Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
|  | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.4.4-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.  Note 12: Including test tolerance given in Annex F.1.3.2. | | | | | | | |

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 = 260+10 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%.

#### 7.5.5.5 NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.5.1 Test purpose

The purpose of this test is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used, and to verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in TS 38.133 [6] clause 8.5.7 and 8.5.8.

7.5.5.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.5.

7.5.5.5.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.5.4-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure 7.5.5.5.4-2 shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

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Figure 7.5.5.5.4-1: SNR variation for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

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Figure 7.5.5.5.4-2: SSB\_RP level variation for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

7.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.5.4.1-1.

Table 7.5.5.5.4.1-1: Supported test configurations for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.5-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.5.5.5-2 | NR 240 kHz SSB SCS, 100MHz 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 7.5.5.5.4.1-2.

Table 7.5.5.5.4.1-2: Initial conditions for NR SA FR2 scheduling availability restriction during 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.5-1 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 7.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.5.4.1-3.

2. Message contents are defined in clause 7.5.5.5.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.5.4.1-3: General test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1-2 |  | Cell 1 |  |
| RF Channel Number | | 1-2 |  | 1 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 | Table A.1.5-3 |
| BWchannel | | 1-2 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD | Table A.1.1.2-3 |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | Table A.1.2.2-3 |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD | Table A.1.3.2-3 |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 | Table A.2.1-1 |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.1 FR2 | Table A.3.2-1 |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.1 | Table A.4-1 |
| PRACH Configuration | | 1-2 |  | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 |  | OFF |  |
| SSB index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109 Note 3 | Threshold used for Qin\_LR\_SSB |
| 2 | -106 Note 3 |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 2.6 |  |
| T3 | | 1-2 | s | 1.64 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 1.01 |  |
| D1 | | 1-2 | s | 0.97 |  |
| 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: Including test tolerance given in Annex F.1.3.2. | | | | | |

7.5.5.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.5.5.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.5.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.5.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.5.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) which are not overlapped with SSBs configured for beam failure detection during the period from time point B to time point D

and

b) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point D until T5 expires,

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.5.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *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.

7.5.5.5.4.3 Message contents

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

Table 7.5.5.5.4.3-1: Common Exception messages for NR SA FR2 scheduling availability restriction during 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.3.1-8 with Condition SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A |

7.5.5.5.5 Test requirement

Table 7.5.5.5.4.1-3 and 7.5.5.5.5-1 define the primary level settings including test tolerances for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.5.5-1: NR Cell specific test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA Setup | |  | Setup1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| 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 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -84.7 Note 12 | -84.7 Note 12 | -84.7 Note 12 |
| Config 2 | -101.5 | -101.5 | -81.7 Note 12 | -81.7 Note 12 | -81.7 Note 12 |
|  | Config 1 | dBm/120KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.5.4-1.  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 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.  Note 12: Including test tolerance given in Table F.1.3.2-4 | | | | | | | |

The UE behaviour during time duration T3 follows the requirements defined in TS 38.133 [6] clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in TS 38.133 [6] clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

#### 7.5.5.6 NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

7.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, 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 FR2 SCell requirements in TS 38.133 [6] clause 8.5.

7.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

7.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.6.

7.5.5.6.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.6.4-1 shows the variation of the downlink SNR of the CSI-RS in set q0 in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.6.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

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Figure 7.5.5.6.4-1: SNR variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode

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Figure 7.5.5.6.4-2: CSI-RS\_RP level variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode

7.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.6.4.1-1.

Table 7.5.5.6.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.6-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 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 7.5.5.6.4.1-2.

Table 7.5.5.6.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing 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.5-1 and TS 38.508-1 [14] clause 4.3.1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.6.4.1-3.

2. Message contents are defined in clause 7.5.5.6.4.3.

3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.6.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1 |  | Cell 1 |  |
| RF Channel Number for PCell | | 1 |  | 1 |  |
| Active SCell | | 1 |  | Cell 2 |  |
| RF Channel Number for SCell | | 1 |  | 2 |  |
| Duplex mode | | 1 |  | TDD |  |
| TDD Configuration | | 1 |  | TDDConf.3.1 |  |
| BWchannel | | 1 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 |  |
| DL initial BWP configuration | | 1 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| OCNG parameters | | 1 |  | OP.1 | A.2.1 |
| CP length | | 1 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.3 FR2 | A.3 |
| SMTC Configuration | | 1 |  | SMTC.3 | A.4 |
| PRACH Configuration | | 1 |  | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | | 1 |  | OFF |  |
| CSI-RS configuration for BFD/CBD on SCell | | 1 |  | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS (q0) | | 1 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1 |  | 1 |  |
| CSI-RS configuration for RLM on PCell | | 1 |  | CSI-RS.3.2 TDD | A.1.4.2 |
| Beam failure detection transmission parameters | DCI format | 1 |  | 1-0 |  |
| Number of Control OFDM symbols | 1 |  | 2 |  |
| Aggregation level | 1 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 |  |
| DMRS precoder granularity | 1 |  | REG bundle size |  |
| REG bundle size | 1 |  | 6 |  |
| Gap pattern ID | | 1 |  | N/A |  |
| schedulingRequestID-BFR-SCell-r16 | | 1 |  | Configured |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 4 |  |
| PUCCH parameters for SR configuration for BFR on SCell | | 1 |  | Table 8.3.3.1.2-1 in [28] |  |
| rlmInSyncOutOfSyncThreshold | | 1 |  | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109Note 2 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 |  | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | | 1 |  | periodic |  |
| reportQuantity | | 1 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1 | slot | 40 |  |
| CSI reporting offset | | 1 | slot | 4 |  |
| T310 | | 1 | ms | 1000 |  |
| N310 | | 1 |  | 2 |  |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 1.17 |  |
| T3 | | 1 | s | 0.9 |  |
| T4 | | 1 | s | 0 |  |
| T5 | | 1 | s | 0.31 |  |
| D1 | | 1 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: Including test toelerance given in Annex F.1.3.2 | | | | | |

7.5.5.6.4.2 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 defined in CSI-RS configuration. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.6.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.6.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.6.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.6.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-2 [18] 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 PUCCH with LRR before time point B, and

c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.6.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and 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 4.5.4.

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

7.5.5.6.4.3 Message contents

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

Table 7.5.5.6.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

|  |  |
| --- | --- |
| 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.3.1-12 on Cell 3  Table H.3.1-13 on Cell 3 |

Table 7.5.5.6.4.3-2: MAC-CellGroupConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { |  |  |  |
| schedulingRequestID-BFR-SCell-r16 | SchedulingRequestId |  |  |
| } |  |  |  |

Table 7.5.5.6.4.3-3: *SchedulingRequestResourceConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequestResourceConfig ::= SEQUENCE { |  |  |  |
| periodicityAndOffset CHOICE { |  |  |  |
| sl40 | 4 |  |  |
| } |  |  |  |
| } |  |  |  |

7.5.5.6.5 Test requirement

Tables 7.5.5.6.4.1-3 and 7.5.5.6.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX.

Table 7.5.5.6.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell1** | **Cell2**  **Test 1** | | | | |
|  | |  | **T1 to T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | |  | Setup 1 defined in A.9.1 | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS  kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| Noc | Config 1 | dBm/120kHz | -104.7 | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.6.4-1.  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 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | | | | |

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 initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1. The UE shall not transmit PUCCH with an LRR 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%.

#### 7.5.5.7 NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, 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 FR2 SCell requirements in TS 38.133 [6] clause 8.5.

7.5.5.7.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

7.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.7.

7.5.5.7.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.7.4-1 shows the variation of the downlink SNR of the CSI-RS in set q0 in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.7.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

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Figure 7.5.5.7.4-1: SNR variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode

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Figure 7.5.5.7.4-2: CSI-RS\_RP level variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode

7.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.7.4.1-1.

Table 7.5.5.7.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 7.5.5.7-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 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 7.5.5.7.4.1-2.

Table 7.5.5.7.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing 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.5-1 and TS 38.508-1 [14] clause 4.3.1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.7.4.1-3.

2. Message contents are defined in clause 7.5.5.7.4.3.

3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.7.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1 |  | Cell 1 |  |
| RF Channel Number for PCell | | 1 |  | 1 |  |
| Active SCell | | 1 |  | Cell 2 |  |
| RF Channel Number for SCell | | 1 |  | 2 |  |
| Duplex mode | | 1 |  | TDD |  |
| TDD Configuration | | 1 |  | TDDConf.3.1 |  |
| BWchannel | | 1 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 |  |
| DL initial BWP configuration | | 1 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| OCNG parameters | | 1 |  | OP.1 | A.2.1 |
| CP length | | 1 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.3 FR2 | A.3 |
| SMTC Configuration | | 1 |  | SMTC.3 | A.4 |
| PRACH Configuration | | 1 |  | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | | 1 |  | DRX.3 | A.5 |
| CSI-RS configuration for BFD/CBD on SCell | | 1 |  | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS (q0) | | 1 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1 |  | 1 |  |
| CSI-RS configuration for RLM on PCell | | 1 |  | CSI-RS.3.2 TDD | A.1.4.2 |
| Beam failure detection transmission parameters | DCI format | 1 |  | 1-0 |  |
| Number of Control OFDM symbols | 1 |  | 2 |  |
| Aggregation level | 1 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 |  |
| DMRS precoder granularity | 1 |  | REG bundle size |  |
| REG bundle size | 1 |  | 6 |  |
| Gap pattern ID | | 1 |  | N/A |  |
| schedulingRequestID-BFR-SCell-r16 | | 1 |  | Configured |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 4 |  |
| PUCCH parameters for SR configuration for BFR on SCell | | 1 |  | Table 8.3.3.1.2-1 in [28] |  |
| rlmInSyncOutOfSyncThreshold | | 1 |  | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109Note 2 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 |  | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1 |  | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 |  | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | | 1 |  | periodic |  |
| reportQuantity | | 1 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1 | slot | 40 |  |
| CSI reporting offset | | 1 | slot | 4 |  |
| T310 | | 1 | ms | 1000 |  |
| N310 | | 1 |  | 2 |  |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 5.43 |  |
| T3 | | 1 | s | 5.16 |  |
| T4 | | 1 | s | 0 |  |
| T5 | | 1 | s | 0.31 |  |
| D1 | | 1 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: Including test toelerance given in Annex F.1.3.2 | | | | | |

7.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell 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. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.7.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier 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 PUCCH with LRR before time point B, and

c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and 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 4.5.4.

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

7.5.5.7.4.3 Message contents

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

Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |
| --- | --- |
| 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.3.1-12 on Cell 3  Table H.3.1-13 on Cell 3  Table H.3.7-1 with condition DRX.3 |

Table 7.5.5.7.4.3-2: MAC-CellGroupConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { |  |  |  |
| schedulingRequestID-BFR-SCell-r16 | SchedulingRequestId |  |  |
| } |  |  |  |

Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequestResourceConfig ::= SEQUENCE { |  |  |  |
| periodicityAndOffset CHOICE { |  |  |  |
| sl40 | 4 |  |  |
| } |  |  |  |
| } |  |  |  |

7.5.5.7.5 Test requirement

Tables 7.5.5.7.4.1-3 and 7.5.5.7.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

Table 7.5.5.7.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell1** | **Cell2**  **Test 1** | | | | |
|  | |  | **T1 to T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | |  | Setup 1 defined in A.9.1 | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  |  | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS  kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| Noc | Config 1 | dBm/120kHz | -104.7 | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |
| 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 7.5.5.7.4-1.  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 is modified as specified in clause D.4.  Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | | | | |

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 initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1. The UE shall not transmit PUCCH with an LRR 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%.

#### 7.5.5.8 FFS

FFS.

#### 7.5.5.9 NR SA FR2 SCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

- TT analysis has not been provided.

- TS 38.522 applicability spec update is pending

7.5.5.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure and link recovery in the sets and for TRP1 when DRX is used for an FR2 active Scell requirements in TS38.133[6] clause 8.18.

7.5.5.9.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting TRP specific SCell BFR.

7.5.5.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.9.

7.5.5.9.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.9.4-1shows the variation of the downlink SNR of the CSI-RS in set and in the active SCell for TRP1 and TRP2 respectively. Figure 7.5.5.9.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in for TPR1.

Figure 7.5.5.9.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in DRX mode

7.5.5.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.9.4.1-1.

Table 7.5.5.9.4.1-1: Supported test configurations for FR2 PCell and SCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.9.4.1-2.

Table 7.5.5.9.4.1-2: Initial conditions for SA FR2 beam failure detection and link recovery testing 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.5-1 and TS 38.508-1 [14] clause 4.3.1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.9.4.1-3.

2. Message contents are defined in clause 7.5.5.9.4.3.

3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.9.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| Active PCell | | |  | Cell 1 |  |
| RF Channel Number for PCell | | |  | 1 |  |
| Active SCell | | |  | Cell 2 |  |
| RF Channel Number for SCell | | |  | 2 |  |
| Duplex mode | | Config 1 |  | TDD |  |
| BW channel | | Config 1 |  | 100: NRB,c = 66 |  |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |  |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |  |
| CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD | A.3.1.2 |
| SSB Configuration | | Config 1 |  | SSB.3 FR2 | A.3.11 |
| SMTC Configuration | | Config 1 |  | SMTC.3 | A.3.10 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |  |
| PRACH Configuration | | Config 1 |  | Table A.3.8.3.1-1 |  |
| CSI-RS configuration for TRP0 | | Config 1 |  | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS configuration for TRP1 | | Config 1 |  | CSI-RS.3.6 TDD | A.3.14.2 |
| CSI-RS configuration for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD | A.3.14.2 |
| TRS configuration | | Config 1 |  | TRS.2.1 TDD |  |
| TCI configuration | | Config 1 |  | CSI-RS.Config.0 |  |
| OCNG parameters | |  |  | OP.1 |  |
| CP length | |  |  | Normal |  |
| Correlation Matrix and Antenna Configuration | |  |  | 2x2 Low |  |
| OCNG parameters | | |  | OP.1 | A.3.2.1 |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure | | DCI format |  | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
|  | | DMRS precoder granularity |  | REG bundle size |  |
|  | | REG bundle size |  | 6 |  |
| DRX | | |  | DRX.3 |  |
| Gap pattern ID | | |  | N.A. |  |
| schedulingRequestID-BFR-SCell-r16 | | |  | Configured |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | | Slot | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | | Slot | 5 |  |
| PUCCH parameters for SR configuration for BFR on SCell | | |  | Table 8.3.3.1.2-1 in [13] |  |
| csi-RS-Index assigned as BFD RS in set (q00) | | |  | 0 |  |
| csi-RS-Index assigned as BFD RS in set (q01) | | |  | 2 |  |
| CSI-RS index assigned as RLM RS | | |  | 0, 1 |  |
| CSI-RS Index assigned as CBD RS in set (q10) | | |  | 1 |  |
| CSI-RS Index assigned as CBD RS in set (q11) | | |  | 3 |  |
| SSB index assigned as RLM RS | | |  | 0, 1 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdBFR | Config 1 | | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 10.81 |  |
| T3 | | | s | 10.28 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 0.57 |  |
| D1 | | | s | 0.53 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

7.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is enabled in PCell 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 *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.9.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.9.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.9.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.9.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.9.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.9.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier 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 PUCCH with LRR before time point B, and

c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q10 and q11 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. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and 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 4.5.4.

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

7.5.5.7.4.3 Message contents

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

Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition CSI-RS BFD  Table H.3.1-12A on Cell 3  Table H.3.1-13 on Cell 3 with condition SpCell  Table H.3.7-1 with condition DRX.3 |

Table 7.5.5.7.4.3-2: *MAC-CellGroupConfig for R17 BFR*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1, Table 4.6.3-68 |  |  |  |
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { |  |  |  |
| schedulingRequestID-BFR-r17 | Not present |  |  |
| schedulingRequestID-BFR2-r17 | Not present |  |  |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config |  |  |
| } |  |  |  |

Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
| Information Element | Value/remark | Comment | Condition |
| SchedulingRequestResourceConfig ::= SEQUENCE { |  |  |  |
| periodicityAndOffset CHOICE { |  |  |  |
| sl40 | 4 |  |  |
| } |  |  |  |
| } |  |  |  |

7.5.5.9.5 Test requirements

Tables 7.5.5.9.4.1-3 and 7.5.5.9.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

Table A.7.5.5.9.5.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | **Cell1** | Cell2 | | | | |
|  | **T1 to T5** | T1 | T2 | T3 | T4 | T5 |
| AoA setup |  | Setup 3 as specified in clause A.9.1 | | | | | |
| Assumption for UE beams Note 10 |  | Rough | Rough | | | | |
| 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 | 0 |
| EPRE ratio of PDSCH DMRS to SSS | dB |  |
| EPRE ratio of PDSCH to PDSCH DMRS | dB |  |
| EPRE ratio of OCNG DMRS to SSS | dB |  |
| EPRE ratio of OCNG to OCNG DMRS | dB |  |
| SNR\_CSI-RS of set q0,0 | dB | 5+TT | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
| SNR\_CSI-RS of set q1,0 | dB | 5+TT | 5+TT | 5+TT | 5+TT | 5+TT | 5+TT |
| SNR\_CSI-RS of set q0,1 | dB | 0.2+TT | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
| CSI-RS\_RP of set q0,1 | dBm/  SCS kHz | -104.5+TT | -104.5+TT | -104.5+TT | -84.5+TT | -84.5+TT | -84.5+TT |
| Noc | dBm/120 kHz | -104.7+TT | -104.7+TT | | | | |
| Propagation condition |  | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.7.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause TS38.133 A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: AoA1 for PCell and TRP1 of SCell , AoA2 for TRP2 of SCell | | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.7.5.5.9.1 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 for TRP1 and TRP2.

During the period from time point A to time point B the UE shall transmit uplink signal in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP2.

During T3 the UE shall detect beam failure and initiate link recovery for TRP1. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q0,1.

No later than time point F occurring no later than D1 = [520]+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q0,1. The UE shall not transmit PUCCH with an LRR with the candidate beam set q0,1 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%.

#### 7.5.5.10 NR SA FR2 PCell TRP specific SSB-based Beam Failure Detection and Link Recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

- TT analysis has not been provided.

- TS 38.522 applicability spec update is pending

7.5.5.10.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific SSB-based beam failure and link recovery in the sets and for TRP1 with *schedulingRequestID-BFR-r17* configured, when no DRX is used for an FR2 serving cell requirements in TS38.133[6] clause 8.18.

7.5.5.10.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting TRP specific PCell BFR.

7.5.5.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.10.

7.5.5.10.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.10.4-1 shows the variation of the downlink SNR of the SSB in set and for TRP1 and TRP2 respectively. Figure 7.5.5.10.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set for TPR1.

Figure 7.5.5.10.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

7.5.5.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.10.4.1-1.

Table 7.5.5.10.4-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.10.4.1-2.

Table 7.5.5.10.4.1-2: Initial conditions for SA FR2 beam failure detection and link recovery testing 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.5-1 and TS 38.508-1 [14] clause 4.3.1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.5.10.4.1-3.

2. Message contents are defined in clause 7.5.5.10.4.3.

3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.10.4.1-3: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** | **Comment** |
|  | | |  | **Test 1** | Same configuration for both TRP wherever applicable |
| Active PCell | | |  | Cell 1 |  |
| RF Channel Number for PCell | | |  | 1 |  |
| Duplex mode | | Config 1,2 |  | TDD |  |
| TDD Configuration | | Config 1,2 |  | TDDConf.3.1 |  |
| BW channel | | Config 1,2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | Config 1,2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 120 |  |
| DL initial BWP configuration | | Config 1,2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1,2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1,2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1,2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | Config 1 |  | SR.3.2 TDD |  |
| Config 2 |  | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |  |
| Config 2 |  | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.1 TDD |  |
| Config 2 |  | CCR.3.7 TDD |  |
| OCNG parameters | | Config 1,2 |  | OP.1 |  |
| CP length | | Config 1,2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | Config 1,2 |  | TCI.State.0 |  |
| CSI-RS for tracking | | Config 1,2 |  | TRS.2.1 TDD |  |
| CSI-RS configuration for CSI reporting | | Config 1,2 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | Config 1,2 |  | periodic |  |
| reportQuantity | | Config 1,2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | Config 1,2 | slot | 40 |  |
| CSI reporting offset | | Config 1,2 | slot | 4 |  |
| SSB Configuration for TRP0 | | Config 1 |  | SSB.1 FR2 |  |
| Config 2 |  | SSB.2 FR2 |  |
| SSB Configuration for TRP1 | | Config 1 |  | SSB.9 FR2 |  |
| Config 2 |  | SSB.10 FR2 |  |
| SMTC Configuration | | Config 1,2 |  | SMTC.3 |  |
| PRACH Configuration | | Config 1,2 |  | FR2 PRACH configuration 2 |  |
| DRX configuration | | Config 1,2 |  | OFF |  |
| SSB Index assigned as BFD RS (q0,0) | | Config 1,2 |  | 0 |  |
| SSB Index assigned as CBD RS (q1,0) | | Config 1,2 |  | 1 |  |
| SSB Index assigned as BFD RS (q0,1) | | Config 1,2 |  | 2 |  |
| SSB Index assigned as CBD RS (q1,1) | | Config 1,2 |  | 3 |  |
| SSB Index assigned as RLM RS | | Config 1,2 |  | 0,1,2,3 |  |
| 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 |  |
| Gap pattern ID | | |  | gp0 |  |
| gapOffset | | |  | 0 |  |
| schedulingRequestID-BFR- r17 | | |  | Configured |  |
| Periodicity of PUCCH for SR configuration for BFR on PCell | | | slot | 40 | 5ms |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdBFR | Config 1 | | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| Config 2 | | -92 |
| 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 |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 2.61 |  |
| T3 | | | s | 1.64 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 1.01 |  |
| D1 | | | s | 0.97 |  |
| 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. | | | | | |

7.5.5.10.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.10.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.10.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.10.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.10.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.10.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect a preamble on a beam associated with candidate beam set q10 and q11 before time point B; and

c) detects preamble on a beam associated with candidate beam set q10 and q11 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. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.10.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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.

7.5.5.10.4.3 Message contents

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

Table 7.5.5.10.4.3-1: Common Exception messages for NR SA FR2 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.3.1-8A with Condition CSI-RS BFD  Table H.3.1-10 with Condition CSI-RS  Table H.3.1-10A  Table H.3.7-1 with Condition TRP-SPECIFIC-BFD |

Table 7.5.5.10.4.3-2: *MAC-CellGroupConfig for R17 BFR*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1, Table 4.6.3-68 |  |  |  |
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { |  |  |  |
| schedulingRequestID-BFR-r17 | Not present |  |  |
| schedulingRequestID-BFR2-r17 | Not present |  |  |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config |  |  |
| } |  |  |  |

7.5.5.10.5 Test requirement

Tables 7.5.5.10.4.1-3 and 7.5.5.10.5-1 define the primary level settings including test tolerances for TRP specific NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table7.5.5.10-1: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 3 as specified in clause A.9.1 Note 12 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| 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 q0,0 | Config 1-2 | dB | 5+TTNote 11 | -3+TT Note 11 | -12+TT | -12+TT | -12+TT |
| SNR\_SSB of set q1,0 | Config 1-2 | dB | 5+TT Note 11 | 5+TT Note 11 | 5+TT Note 11 | 5+TT Note 11 | 5+TT Note 11 |
| SNR\_SSB of set q0,1 | Config 1-2 | dB | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
|  | Config 1 | dBm/  SCS | -104.5+TT | -104.5+TT | -84.5+TT | -84.5+TT | -84.5+TT |
| SSB\_RP of set q0,1 |
|  | Config 2 | -101.5+TT | -101.5+TT | -81.5+TT | -81.5+TT | -81.5+TT |
|  | Config 1,2 | dBm/120 KHz | -104.7+TT | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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 A.7.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband  Note 12: AoA1 for TRP1 and AoA2 for TRP2 | | | | | | | |

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 for TRP 1 and TRP2.

During the period from time point A to time point B the UE shall transmit uplink signal for TRP 1 and TRP2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission for TRP 2.

During T3 the UE shall detect beam failure and initiate link recovery for TRP 1. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q0,1.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1,0. The UE shall not transmit PUCCH with an LRR with the candidate beam set q1,0 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### 7.5.6 Active BWP switch delay

#### 7.5.6.1 DCI-based and time-based active BWP switch

##### 7.5.6.1.0 Minimum conformance requirements

[TS 38.133, clause 8.6.2]

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC.

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 the beginning of DL slot n+ TBWPswitchDelay.

The UE is not required to transmit UL signals or receive DL signals during time duration TBWPswitchDelay 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.

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in Table 7.5.6.1.0-1.

Table 7.5.6.1.0-1: BWP switch delay

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | BWP switch delay TBWPswitchDelay (slots) | |
| Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| Note 1: Depends on UE capability.  Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in 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 Clause 8.10 in the new BWP.

##### 7.5.6.1.1 NR SA FR2 DCI-based DL active BWP switch in non-DRX

*Editor’s note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

7.5.6.1.1.1 Test purpose

FFS

7.5.6.1.1.2 Test applicability

FFS

7.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.1.

7.5.6.1.1.4 Test description

7.5.6.1.1.4.1 Initial conditions

FFS

7.5.6.1.1.4.2 Test procedure

FFS

7.5.6.1.1.4.3 Message contents

FFS

7.5.6.1.1.5 Test requirements

FFS

##### 7.5.6.1.2 NR SA FR1-FR2 DCI-based DL active BWP switch in non-DRX

*Editor’s note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

*- NR FR1 - FR2 OTA testability is still FFS.*

7.5.6.1.2.1 Test purpose

FFS

7.5.6.1.2.2 Test applicability

FFS

7.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.2.

7.5.6.1.2.4 Test description

7.5.6.1.2.4.1 Initial conditions

FFS

7.5.6.1.2.4.2 Test procedure

FFS

7.5.6.1.2.4.3 Message contents

FFS

7.5.6.1.2.5 Test requirements

FFS

##### 7.5.6.1.3 NR SA FR2 DCI-based DL active BWP switch in non-DRX

*Editor’s note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

7.5.6.1.3.1 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

7.5.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.3.

7.5.6.1.3.4 Test description

There is one cell configured in this test. Cell 1 is PCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

7.5.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.6.1.3.4.1-1.

Table 7.5.6.1.3.4.1-1: Supported test configurations for NR SA FR2 DCI-based DL active BWP switch in non-DRX

|  |  |
| --- | --- |
| Config | Description |
| 7.5.6.1.3-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: A UE which fulfils the requirements in test case 7.5.6.1.1 or 7.5.6.1.2 can skip the test cases in 7.5.6.1.3. | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.1.3.4.1-2.

Table 7.5.6.1.3.4.1-2: Initial conditions for NR SA FR2 DCI-based DL active BWP switch 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.5-1 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 5.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.TBD | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.TBD |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.6.1.3.4.1-3.

2. Message contents are defined in clause 7.5.6.1.3.4.3.

3. There are one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.6.1.3.4.1-3: General test parameters for NR SA FR2 DCI-based DL active BWP switch in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active Cell |  | Cell 1 | Cell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | [200] |  |
| T1 | s | [0.2] |  |
| T2 | s | [0.2] |  |
| T3 | s | [0.2] |  |

7.5.6.1.3.4.2 Test procedure

FFS

7.5.6.1.3.4.3 Message contents

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

Table 7.5.6.1.3.4.3-1: Common Exception messages for NR SA FR2 DCI-based DL active BWP switch in non-DRX

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

7.5.6.1.3.5 Test requirements

FFS

#### 7.5.6.2 RRC-based active BWP switch

##### 7.5.6.2.0 Minimum conformance requirements

FFS

##### 7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX

*Editor’s note: This test case is incomplete. The following aspects are either missing or TBD*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

7.5.6.2.1.1 Test purpose

FFS

7.5.6.2.1.2 Test applicability

FFS

7.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.2.1.

7.5.6.2.1.4 Test description

7.5.6.2.1.4.1 Initial conditions

FFS

7.5.6.2.1.4.2 Test procedure

FFS

7.5.6.2.1.4.3 Message contents

FFS

7.5.6.2.1.5 Test requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs right after the begining of DL slot and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [12].

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%.

Table 7.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in SA

| **Parameter** | **Unit** | **Cell 1** |
| --- | --- | --- |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Active BWP ID |  | 1 |
| Active DL BWP-1 Configuration |  | DLBWP.0.2 |
| Active DL BWP-2 Configuration |  | DLBWP.1.1 |
| Active UL BWP-1 Configuration |  | ULBWP.1.3 |
| Active UL BWP-2 Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.1 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.1 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State |  | TCI.State.0 |
| TRS Configuration |  | TRS.2.1 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) |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | |

Table 7.5.6.2.1.5-2: OTA related test parameters for BWP switching test case

| Parameter | | Unit | Cell 2 |
| --- | --- | --- | --- |
| Angle of arrival configuration | |  | According to table A.9 |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -112 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCS | -103 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| SS-RSRPNote2 | NR\_TDD\_FR2\_A | dBm/SCS Note3 | -85 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
|  | | dB | 18 |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -56 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone | | | |

### 7.5.7 PSCell addition and release delay

#### 7.5.7.0 Minimum conformance requirements

##### 7.5.7.0.1 Minimum conformance requirements for PSCell addition delay

Upon receiving PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards PSCell in FR2 no later than in subframe *n* + Tconfig\_PSCell:

Where:

Tconfig\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_ DU + 2 ms

TRRC\_delay is the RRC procedure delay as specified in TS 38.331 [13].

Tprocessing is the SW processing time needed by UE, including RF warm up period. Tprocessing = 40 ms.

Tsearch is the time for AGC settling and PSS/SSS detection. If the target cell is known, Tsearch = 0 ms. If the target cell is unknown and the target cell Ês/Iot ≥ -2dB, Tsearch = 24\* Trs ms.

T∆ is time for fine time tracking and acquiring full timing information of the target cell. T∆ = 1\*Trs ms for a known or unknown PSCell.

TPSCell\_ DU is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. TPSCell\_ DU is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the PSCell configuration command:

- the UE has sent a valid measurement report for the PSCell being configured and

- One of the SSBs measured from the PSCell being configured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

- One of the SSBs measured from PSCell being configured also remains detectable during the PSCell configuration delay Tconfig\_PSCell according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

otherwise it is unknown.

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.2.

##### 7.5.7.0.2 Minimum conformance requirements for PSCell release delay

The requirements in this clause shall apply for a UE which is configured with PCell and one PSCell.

Upon receiving PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 38.331 [13] no later than in subframe *n+* TRRC\_delay:

Where

TRRC\_delay is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.3.

#### 7.5.7.1 NR SA FR2 addition and release delay of known PSCell

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram

- Message contents are not complete.

- Test Requirements (still brackets in core-spec for PRACH preamble time [112] ms and CSI report time [20] ms)

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.7.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is known to the UE at the time of addition.

7.5.7.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.1.

7.5.7.1.4 Test description

7.5.7.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.1.4.1-1.

Table 7.5.7.1.4.1-1: Supported test configurations for NR SA FR2 PSCell

|  |  |
| --- | --- |
| Config | Description |
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.7.1.4.1-2.

Table 7.5.7.1.4.1-2: Initial conditions for NR SA FR2 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | TBD |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.7.1.4.1-3.

2. Message contents are defined in clause 7.5.7.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.7.1.4.1-3: General test parameters for NR SA FR2 PSCell addition and release delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test |
| Active PCell | |  | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell | |  | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| A4 | Hysteresis | dB | 0 | Hysteresis for event A4 |
| Threshold RSRP | dBm | -97 | Threshold for event A4 |
| Time to Trigger | S | 0 | Time to trigger for event A4 |
| DRX | |  | OFF | For both PCell and PSCell once activated |
| Measurement gap pattern ID | |  | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration in Cell 2 | |  | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | | ms | [2] |  |
| T1 | | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | | s | 1 | During this time the UE shall identify neighbour cell 2 and report event B1. |
| T3 | | s | 3.5 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |
| T4 | | s | 1 | During this time the UE adds the PSCell. |
| T5 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T6 | | s | 1 | During this time the UE releases the PSCell. |

7.5.7.1.4.2 Test procedure

TBD

7.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.7.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

7.5.7.1.5 Test requirement

TBD

#### 7.5.7.2 NR SA FR2 addition and release delay of unknown PSCell

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram

- Message contents are not complete

- Test Requirements (still brackets in core-spec for PRACH preamble time [572] ms and CSI report time [20] ms)

- TT analysis is missing

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.7.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is unknown to the UE at the time of addition.

7.5.7.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.2.

7.5.7.2.4 Test description

7.5.7.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.2.4.1-1.

Table 7.5.7.2.4.1-1: Supported test configurations for NR SA FR2 PSCell

|  |  |
| --- | --- |
| Config | Description |
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.73.2.4.1-2.

Table 7.5.7.2.4.1-2: Initial conditions for NR SA FR2 PSCell addition and release 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | TBD |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.5.7.2.4.1-3.

2. Message contents are defined in clause 7.5.7.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.7.2.4.1-3: General test parameters for NR SA FR2 PSCell addition and release delay

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | Two radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell |  | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| DRX |  | OFF | For both PCell and PSCell once activated |
| PRACH configuration in Cell 2 |  | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | ms | [2] |  |
| T1 | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | s | 1 | During this time the UE adds the PSCell. |
| T3 | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | s | 1 | During this time the UE releases the PSCell. |

7.5.7.2.4.2 Test procedure

TBD

7.5.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.7.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

7.5.7.2.5 Test requirement

TBD

### 7.5.8 Active TCI state switch delay

#### 7.5.8.0 Minimum conformance requirements

##### 7.5.8.0.0 Known conditions for TCI state

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state

- TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement

- The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command

- The TCI state remains detectable during the TCI state switching period

- The SSB associated with the TCI state remain detectable during the TCI switching period

- SNR of the TCI state ≥ -3dB

Otherwise, the TCI state is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 8.10.2.

##### 7.5.8.0.1 Minimum conformance requirements for MAC-CE based active TCI state switch

If the target TCI state is known (according to clause 7.5.8.0.0), upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ THARQ + + TOk\*(Tfirst-SSB + TSSB-proc) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ THARQ + .Where THARQ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];

- Tfirst-SSB is time to first SSB transmission after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

- TSSB-proc = 2 ms;

- TOk = 1 if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown (according to clause 7.5.8.0.0), upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ THARQ + + TL1-RSRP +TOuk\*(Tfirst-SSB+ TSSB-proc) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ THARQ + .

Where

- T L1-RSRP = 0 in FR1 or when the TCI state switching not involving QCL-TypeD in FR2. Otherwise,

- T L1-RSRP is the time for Rx beam refinement in FR2, defined as

- TL1-RSPR\_Measurement\_Period\_SSB for SSB as specified in TS 38.133 [6] clause 9.5.4.1,

- with the assumption of M=1

- with TReport = 0

- TL1-RSRP\_Measurement\_Period\_CSI-RS for CSI-RS as specified in TS 38.133 [6] clause 9.5.4.2

- configured with higher layer parameter *repetition* set to ON

- with the assumption of M=1 for periodic CSI-RS

- for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*

- with TReport = 0

- TOuk = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD

- TOuk = 1 when TCI state switching involves other QCL types only

- Tfirst-SSB is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

- Tfirst-SSB is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;

- The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

The normative reference for this requirement is TS 38.133 [6] clause 8.10.3.

##### 7.5.8.0.2 Minimum conformance requirements for RRC based active TCI state switch

If the target TCI state is known (according to clause 7.5.8.0.0), UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ (TRRC\_processing +TOk\*(Tfirst-SSB + TSSB-proc)) / *NR slot length*, The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.

- TRRC\_processing is the RRC processing delay defined in Clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in clause 12 of TS 38.331 [13].

- Tfirst-SSB is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state.

- TSSB-proc and TOk are defined in Ts 38.133 [6] clause 8.10.3.

If the target TCI state is unknown (according to clause 7.5.8.0.0), UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ (TRRC\_processing  +TL1-RSRP +TOuk\*(Tfirst-SSB + TSSB-proc)) / *NR slot length*, The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.

- TRRC\_processing is the RRC processing delay defined in clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in clause 12 of TS 38.331 [13].

- Tfirst-SSB is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

- Tfirst-SSB is time to first SSB transmission after RRC processing time at the UE for other QCL types;

- The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

- TL1-RSRP, TOuk and TSSB-proc are defined in TS 38.133 [6] clause 8.10.3.

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list. When a longer switching delay is allowed. Where is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.10.5.

#### 7.5.8.1 NR SA FR2 MAC-CE based active TCI state switch

##### 7.5.8.1.1 NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

Editor's Note: This test case is incomplete. The following aspects are either missing or TBD:

- TT analysis is missing.

- Applicability needs to be updated in 38.522

7.5.8.1.1.1 Test purpose

The purpose of this test is to verify the MAC-CE based active TCI state switch delay requirement specified in clause 7.5.8.0.1.

7.5.8.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting SA FR2, more than one TCI state configuration, and more than one simultaneously trackable TRS resource set.

7.5.8.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.8.1.1.

7.5.8.1.1.4 Test description

7.5.8.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.8.1.1.4.1-1.

Table 7.5.8.1.1.4.1-1: Supported test configurations for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |
| --- | --- |
| Config | Description |
| 7.5.8.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.1.1.4.1-2.

Table 7.5.8.1.1.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active TCI state switch

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.5.8.1.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.5.8.1.1.4.1-3.

Table 7.5.8.1.1.4.1-3: General test parameters for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

7.5.8.1.1.4.2 Test procedure

The test scenario comprises of one NR PCell (Cell 1) as given in Table 7.5.8.1.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.8.1.1.5-1. The OTA related test parameters for FR2 are shown in Table 7.5.8.1.1.5-2.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL’d to SSB0) and TCIstate 1 (QCL’d to SSB1), in Cell 1 before starting the test.

- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure 7.5.8.1.1.5-1 and Figure 7.5.8.1.1.5-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 till n+ THARQ +3 ms. The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+ THARQ +3 ms + (Tfirst-SSB + TSSB-proc).

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.8.1.1.5-1. Propagation conditions are set according to clause C.2.3.

3. The SS transmits an *RRCReconfiguration* message to configure 2 different TCI states for Cell 1, PDCCH TCI state 0 (QCL’d to SSB0) and TCIstate 1 (QCL’d to SSB1), as indicated in clause 7.5.8.1.1.4.3. This message does not configure *tci-PresentInDCI* in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

4. The UE transmits an *RRCReconfigurationComplete* message.

5. The SS shall send a MAC-CE to the UE indicating TCI state 0 as the active PDCCH TCI state. The SS shall continously transmit PDCCHs to the UE indicating new transmissions on PCell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.

6. T1 starts. During T1 only SSB0, to which PDCCH TCI-state 0 is QCL'd, is transmitted.

7. When T1 expires the SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reports for both SSB0 and SSB1 as indicated in clause 7.5.8.1.1.4.3. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.5.8.1.1.5-2 and SSB1, corresponding to TCI state 1, starts transmitting. T2 starts.

8. The SS sends, in slot n, a MAC-CE to indicate switch to TCI-state 1 as the active PDCCH TCI state. Slot n is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.

9. During T2, if the SS:

a) Receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 until slot n + THARQ +3 ms, and

b) Receives ACK/NACK on TCI-state 1 corresponding to the next scheduled DL slot after n + THARQ +5 ms + Tfirst-SSB, where Tfirst-SSB is the time to the first SSB transmission immediately after the MAC-CE command,

the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

10. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI-state 0.

11. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK corresponding to PDSCH transmissions scheduled on TCI-state 0 continue to step 12. Otherwise switch the UE off and on and continue to step 1.

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

7.5.8.1.1.4.3 Message contents

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

Table 7.5.8.1.1.4.3-1: Common Exception messages for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |
| --- | --- |
| 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.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with condition SSB |

Table 7.5.8.1.1.4.3-2: *ControlResourceSet* for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-28 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF { | 2 entries |  |  |
| TCI-StateId[0] | 0 | TCI.State.2 |  |
| TCI-StateId[1] | 1 | TCI.State.3 |  |
| } |  |  |  |
| tci-PresentInDCI | Not present |  |  |
| } |  |  |  |

Table 7.5.8.1.1.4.3-3: *PDSCH-Config* for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| tci-StatesToAddModList SEQUENCE(SIZE (1.. maxNrofTCI-States)) OF TCI-State { | 2 entries |  |  |
| TCI-State[0] | TCI.State.2 | TCI-StateId 2 |  |
| TCI-State[1] | TCI.State.3 | TCI-StateId 3 |  |
| } |  |  |  |
| } |  |  |  |

Table 7.5.8.1.1.4.3-4: *TCI-State* for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
| Information Element | Value/remark | Comment | Condition |
| TCI-State ::= SEQUENCE { | 2 entries |  |  |
| { |  |  |  |
| tci-StateId | 0 | TCI.State.2 |  |
| qcl-Type1 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeA |  |  |
| } |  |  |  |
| qcl-Type2 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeD |  |  |
| } |  |  |  |
| }, |  |  |  |
| { |  |  |  |
| tci-StateId | 1 | TCI.State.3 |  |
| qcl-Type1 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeA |  |  |
| } |  |  |  |
| qcl-Type2 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeD |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| Note 1: Both TRS.2.1 TDD and TRS.2.2 TDD are configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.1 TDD = {0,1,2,3}, TRS.2.2 TDD = {4,5,6,7}, so resource #4 for each set corresponds to index 3 and 7, accordingly. | | | |

7.5.8.1.1.5 Test requirement

Tables 7.5.8.1.1.4.1-3, 7.5.8.1.1.5-1 and 7.5.8.1.1.5-2 define the primary level settings including test tolerances for NR SA Pcell FR2 MAC-CE based active TCI state switch for a known TCI state.

Table 7.5.8.1.1.5-1: NR Cell specific test parameters for NR SA Pcell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TCI.State.2 |
| TCI State 1 |  | TCI.State.3 |
| TRS Configuration |  | TRS.2.1 TDD  TRS.2.2 TDD |
| 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) |  |  |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

Table 7.5.8.1.1.5-2: OTA related test parameter for NR SA Pcell FR2 MAC-CE based active TCI state switch for a known TCI state

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | |
|  |  | SSB0 | | SSB1 | |
|  |  | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | Setup 3 according to clause A.9 | | | |
|  |  | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 |  | Rough | | | |
| Ês | dBm/SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| SS B\_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| BB Note 7 | dB | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT |
| IoNote2 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT |
| Note 1: Void  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | |



Figure 7.5.8.1.1.5-1: Time multiplexed downlink transmissions during T1



Figure 7.5.8.1.1.5-2: Time multiplexed downlink transmissions during T2

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ THARQ +3 ms

- be able to start receiving on TCI state 1 after n+ THARQ +5 ms + Tfirst-SSB

#### 7.5.8.2 NR SA FR2 RRC based active TCI state switch

##### 7.5.8.2.1 NR SA Pcell FR2 RRC based active TCI state switch for a known TCI state

Editor's Note: This test case is incomplete. The following aspects are either missing or TBD:

- TT analysis is missing.

- Applicability needs to be updated in 38.522

7.5.8.2.1.1 Test purpose

The purpose of this test is to verify the RRC based active TCI state switch delay requirement specified in clause 7.5.8.0.2.

7.5.8.2.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting SA FR2, more than one TCI state configuration, and more than one simultaneously trackable TRS resource set.

7.5.8.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.8.2.1.

7.5.8.2.1.4 Test description

7.5.8.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.8.2.1.4.1-1.

Table 7.5.8.2.1.4.1-1: Supported test configurations for NR SA Pcell FR2 RRC based active TCI state switch for a known TCI state

|  |  |
| --- | --- |
| Config | Description |
| 7.5.8.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.2.1.4.1-2.

Table 7.5.8.2.1.4.1-2: Initial conditions for NR SA Pcell FR2 RRC based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.5.8.2.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.5.8.2.1.4.1-3.

Table 7.5.8.2.1.4.1-3: General test parameters for NR SA Pcell FR2 RRC based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active Pcell |  | Cell 1 | Pcell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 2 |  |

7.5.8.2.1.4.2 Test procedure

The test scenario comprises of one NR Pcell (Cell 1) as given in Table 7.5.8.2.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.8.2.1.5-1. The OTA related test parameters for FR2 is shown in Table 7.5.8.2.1.5-2.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is configured with 1 TCI state for PCell, PDCCH-TCI-state0 (QCL’d to SSB0)

- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. Figure 7.5.8.2.1.5-1 and Figure 7.5.8.2.1.5-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI-state1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+ TRRC\_processing  + Tfirst-SSB + 2ms.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.8.2.1.5-1. Propagation conditions are set according to clause C.2.3.

3. The SS transmits an *RRCReconfiguration* message to configure 1 TCI state for Cell 1, PDCCH TCI state 0 (QCL’d to SSB0) and indicating TCI state 0 as the active PDCCH TCI state, as indicated in clause 7.5.8.2.1.4.3. This message does not configure *tci-PresentInDCI* in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

4. The UE transmits an *RRCReconfigurationComplete* message.

5. The SS shall continuously transmit PDCCHs to the UE indicating new transmissions on Pcell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.

6. T1 starts. During T1 only SSB0, to which PDCCH TCI-state 0 is QCL’d, is transmitted.

7. When T1 expires the SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reports for both SSB0 and SSB1 as indicated in clause 7.5.8.2.1.4.3. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.5.8.2.1.5-2 and SSB1, corresponding to TCI state 1, starts transmitting. T2 starts.

8. The SS sends, in slot n, an *RRCReconfiguration* message to indicate switch to TCI-state 1 as the active PDCCH TCI state, as indicated in clause 7.5.8.2.1.4.3. Slot n is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.

9. The UE transmits an *RRCReconfigurationComplete* message.

10. During T2, if the SS receives ACK/NACK on TCI-state 1 corresponding to the next scheduled DL slot after n + Tfirst-SSB + 12 ms, where Tfirst-SSB is the time to the first SSB transmission immediately after the RRC processing by the UE, the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

11. When T2 expires the SS shall sends an *RRCReconfiguration* message to indicate switch to TCI-state 0 as the active PDCCH TCI state and releasing TCI-state 1.

12. The UE transmits an *RRCReconfigurationComplete* message.

13. Wait 2s for the UE to switch TCI-state 0. If the SS receives ACK/NACK corresponding to PDSCH transmissions scheduled on TCI-state 0 continue to step 14. Otherwise switch the UE off and on and continue to step 1.

14. Repeat steps 2-13 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.8.2.1.4.3 Message contents

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

Table 7.5.8.2.1.4.3-1: Common Exception messages for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state

|  |  |
| --- | --- |
| 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.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with condition SSB |

Table 7.5.8.2.1.4.3-2: *ControlResourceSet* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-28 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF { | 1 entry | 1 entry configured at a time (steps 3 and 8) |  |
| TCI-StateId[0] | 0 | TCI.State.2 | Step 3 |
| TCI-StateId[1] | 1 | TCI.State.3 | Step 8 |
| } |  |  |  |
| tci-PresentInDCI | Not present |  |  |
| } |  |  |  |

Table 7.5.8.2.1.4.3-3: *PDSCH-Config* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| tci-StatesToAddModList SEQUENCE(SIZE (1.. maxNrofTCI-States)) OF TCI-State { | 1 entry | 1 entry configured at a time (steps 3 and 8) |  |
| TCI-State[0] | TCI.State.2 | TCI-StateId 2 | Step 3 |
| TCI-State[1] | TCI.State.3 | TCI-StateId 3 | Step 8 |
| } |  |  |  |
| } |  |  |  |

Table 7.5.8.2.1.4.3-4: *TCI-State* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state (step 3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
| Information Element | Value/remark | Comment | Condition |
| TCI-State ::= SEQUENCE { | 1 entry | 1 entry configured at a time (steps 3 and 8) |  |
| { |  |  |  |
| tci-StateId | 0 | TCI.State.2 | Step 3 |
| qcl-Type1 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeA |  |  |
| } |  |  |  |
| qcl-Type2 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeD |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| Note 1: TRS.2.1 TDD is configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.1 TDD = {0,1,2,3}, so resource #4 for the set corresponds to index 3, correspondingly. | | | |

Table 7.5.8.2.1.4.3-5: *TCI-State* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state (step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
| Information Element | Value/remark | Comment | Condition |
| TCI-State ::= SEQUENCE { | 1 entry | 1 entry configured at a time (steps 3 and 8) |  |
| { |  |  |  |
| tci-StateId | 1 | TCI.State.3 | Step 8 |
| qcl-Type1 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeA |  |  |
| } |  |  |  |
| qcl-Type2 SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| referenceSignal CHOICE { |  |  |  |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 |  |
| } |  |  |  |
| qcl-Type | typeD |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| Note 1: TRS.2.2 TDD is configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.2 TDD = {4,5,6,7}, so resource #4 for the set corresponds to index 7, correspondingly. | | | |

7.5.8.2.1.5 Test requirement

Tables 7.5.8.2.1.4.1-3, 7.5.8.2.1.5-1 and 7.5.8.2.1.5-2 define the primary level settings including test tolerances for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state.

Table 7.5.8.2.1.5-1: NR Cell specific test parameters for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TCI.State.2 |
| TCI State 1 |  | TCI.State.3 |
| reportConfigType |  | ssb-Index-RSRP |
| reportConfigType |  | periodic |
| Number of reported RS |  | 2 |
| L1-RSRP reporting period | slot | 640 |
| timeRestrictionForChannelMeasurements |  | configured |
| TRS Configuration |  | TRS.2.1 TDD  TRS.2.2 TDD |
| 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) |  |  |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

Table 7.5.8.2.1.5-2: OTA related test parameter for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | |
|  |  | SSB0 | | SSB1 | |
|  |  | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | Setup 3 according to clause A.9 | | | |
|  |  | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 |  | Rough | | | |
| Ês | dBm/SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| SS B\_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| BB Note 7 | dB | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT |
| IoNote2 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT |
| Note 1: Void  Note 2: SS B\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | |



Figure 7.5.8.2.1.5-1: Time multiplexed downlink transmissions during T1



Figure 7.5.8.2.1.5-2: Time multiplexed downlink transmissions during T2

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after n+ TRRC\_processing  + Tfirst-SSB + 2ms.

#### 7.5.8.3 MAC-CE based active TCI state switch for HST FR2 scenario

##### 7.5.8.3.0 Minimum conformance requirements

For FR2 power class 6 UE*,* if the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the symbol m of the first slot that is after slot n+ THARQ + + TOk\*(Tfirst-SSB + TSSB-proc + Trs + Trs-proc) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ THARQ + .Where THARQ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3];

- Tfirst-SSB is time to first SSB transmission after MAC CE command is decoded by the UE;

- TSSB-proc = 2 ms;

- Trs is time to the first TRS or SSB transmission after the SSB transmission in the definition of Tfirst-SSB is processed by the UE;

- Trs-proc = 2 ms;

- TOk = 1, m = 0 if target TCI state is not in the active TCI state list for PDSCH; otherwise TOk = 0, m = 1.

When *highSpeedMeasFlagFR2-r17* is configured and *highSpeedLargeOneStepUL-TimingFR2-r17* is enabled for UE supporting FR2 power class 6 and [*largeOneStepUL-timingFR2-r17*] capability, the following requirements apply to the UE:

- If the absolute value , the requirement in clause 7.1.2.1 apply to the first UL transmission after a TCI state switch.

- Otherwise, the UE transmit timing immediately after TCI state switch shall be and clause 7.1.2.1 requirements don’t apply.

- The UE UL transmission timing error after the TCI state switching procedure shall be less than or equal to ±Te as specified in clause 7.1.2 if the new target TCI state is within active TCI state list, otherwise ±[7Ts], and the reference point is .

Above,

- (in units) is the DL timing defined as the time when UE receives downlink frame with new target TCI state.

- (in units) is the DL timing defined as the time when UE receives downlink frame with old source TCI state.

##### 7.5.8.3.1 NR PCell FR2 HST active TCI state switch for a known TCI state

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD:

- Test tolerance and measurement uncertainty analysis are missing

7.5.8.3.1.1 Test Purpose

The purpose of this test is to verify the active TCI state switch delay requirement defined in TS 38.133[6] section 8.10.13A for FR2 power class 6 UE. Furthermore, the purpose of this test is also to verify the one shot large timing adjustment requirement as specified in TS 38.133[6] section 7.1.2.3.

7.5.8.3.1.2 Test Applicability

This test applies to all types of NR UE power class 6 release 17 onwards that supports one shot UL large timing adjustment *largeOneStepUL-timingFR2-r17.*

7.5.8.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.3.0.

The normative reference for this requirement is TS 38.133 [6] clauses 7.1.2.3, 8.10.13A and A.7.5.8.3.1.

7.5.8.3.1.4 Test description

Supported test configurations are shown in table 7.5.8.3.1.4.1-1. The test parameters are given in Tables 7.5.8.3.1.4.1-2, 7.5.8.3.1.4.1-3 and 7.5.8.3.1.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of two successive time periods, with time duration of T1 and T2. Figure 7.5.8.3.1.4-1 and Figure 7.5.8.3.1.4-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting, which has the relative timing delay compared to TCI state 0 by the absolute value of the one-way differential propagation time [].



Figure 7.5.8.3.1.4-1: Time multiplexed downlink transmissions during T1



Figure 7.5.8.3.1.4-2: Time multiplexed downlink transmissions during T2

7.5.8.3.1.4.1 Initial conditions

Table 7.5.8.3.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 7.5.8.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL’d to SSB0) and TCI state 1 (QCL’d to SSB1), in Cell 1 before starting the test.

- UE is indicated in TCI state 0 as the active PDCCH TCI state.

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.1.3.4.1-2.

**Table 7.5.8.3.1.4.1-2: Initial conditions for Active TCI state switch delay for HST FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, 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 7.5.8.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

Table 7.5.8.3.1.4.1-3: General test parameters for TCI state switch

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

1. The general test parameter settings are set up according to Table 7.5.8.3.1.4.1-3.

2. Message contents are defined in clause 7.5.8.3.1.4.3.

3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.5.8.3.1.4.2 Test procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.5.8.3.1.5-2.

3. During T1 only SSB to which PDCCH-TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting, which has the relative timing delay compared to TCI state 0 by the absolute value of the one-way differential propagation time [].

4. The UE shall start sending periodic L1-RSRP reports.

5. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

6. After the TCI state switch, the UE transmit timing accuracy shall be measured by the test equipment by using the SRS defined in Table 7.5.8.3.1.5-3.

7. Repeat steps 2-6 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.8.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-169in 38.508-1 [14] withcondition R17 HST FR2 |
| Specific message contents exceptions for Test Configuration 7.5.8.3.1-1 |  |

7.5.8.3.1.5 Test requirements

Table 7.5.8.3.1.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.5.8.3.1.5-1: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3. 2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP. 5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TCI.State.0 |
| TCI State 1 |  | TCI.State.1 |
| TRS Configuration |  | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 |
| 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) |  |  |
| Propagation Condition |  | AOA1: AWGN  AOA2: AWGN with 19444 Hz frequency offset |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

Table 7.5.8.3.1.5-2: OTA related test parameters for TCI state switch

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | |
|  |  | SSB0 | | SSB1 | |
|  |  | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | Setup 3 according to clause A.3.15.3 | | | |
|  |  | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 |  | Rough | | | |
| Ês | dBm/SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| SSB\_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| BB Note 7 | dB | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT |
| IoNote2 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT |
| Note 1: Void  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.6-4. | | | | | |

**Table 7.5.8.3.1.5-3: Sounding Reference Symbol Configuration**

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| c-SRS | 16 | Frequency hopping is disabled |
| 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=0 | 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 [2]. | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After the TCI state switch, the UE transmission timing immediately after TCI state switch shall follow the requirements as specified in clause 7.5.8.3.1.0.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ THARQ +3 ms

- be able to start receiving on TCI state 1 after n+ THARQ +7 ms + Tfirst-SSB+ Trs

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

### 7.5.9 to 7.5.10

### 7.5.11 UE UL carrier RRC reconfiguration delay

#### 7.5.11.1 UE UL carrier RRC reconfiguration delay

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.11.1.1 Test purpose

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively. The test will also verify the interruption at UL carrier configuration requirements on PCell in TS 38.133 [6] clause 8.2.2.2.4.

7.5.11.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting 5GS NR SA FR2.

7.5.11.1.3 Minimum conformance requirements

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.11.1.

7.5.11.1.3.1 UE UL carrier configuration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within TUL\_carrier\_config from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.

- TUL\_carrier\_config equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] 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 [13].

7.5.11.1.3.2 UE carrier deconfiguration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within TUL\_carrier\_deconfig from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.

- TUL\_carrier\_deconfig equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] 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 [13].

7.5.11.1.4 Test description

7.5.11.1.4.1 Initial conditions

There are two cells: FR2 PCell (Cell 1) on NR RF channel 1 and FR2 SCell (Cell 2) on NR RF channel 2. NR uplink is broadcast by *ServingCellConfigCommonSIB.* The test parameters for PCell and SCell are given in Table 7.5.11.4.1-1, Table 7.5.11.4.1-2 and Table 7.5.11.4.1-3. The test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 2 is not configured to UE*.* At the start of T2, a NR uplink of Cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission on the NR uplink of Cell 2. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

The test equipment also verifies that potential interruption of PCell due to UL carrier configuration on SCell is carried out within the correct time span and within the correct length by monitoring ACK/NACK sent in PCell.

Table 7.5.11.1.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | PCell (Cell 1) | SCell (Cell 2) |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | DL and UL: 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table 7.5.11.1.4.1-2: Initial conditions for SA UE uplink RRC reconfiguration delay for FR2

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] clause 4.3.1.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.11.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.3.3 |
| Exceptions to connection diagram | N/A | |  |

Table 7.5.11.1.4.1-3: General test parameters for SA UE UL carrier RRC reconfiguration Delay for FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2 | Two NR RF channels |
| Active cell |  | Config 1 | Cell 1: FR2 PCell  Cell 2: FR2 SCell | PCell on RF channel number 1  FR2 SCell 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 |
| Cell 2 timing offset to Cell 1 | μs | Config 1 | 3 | Synchronous cells. |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 5 |  |
| T3 | s | Config 1 | 5 |  |

7.5.11.1.4.2 Test procedure

Test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. There are two cells: FR2 PCell (Cell 1) on NR RF channel 1 and FR2 SCell (Cell 2) on NR RF channel 2. NR uplink is broadcast by *ServingCellConfigCommonSIB.*

1. Ensure the UE is in RRC\_CONNECTED state with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameter for PCell and SCell according to the table 7.5.11.1.4.1-1, 7.5.11.1.4.1-2 and 7.5.11.1.4.1-3.

3. T1 starts. At this moment NR uplink of Cell 2 is not configured to UE.

4. When T1 expires the SS shall initiates the *RRCReconfiguration* procedure to UE to configure the NR UL of Cell2. T2 starts.

5. The UE:

a) Starts transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

and

b) Interruption of PCell due to UL carrier configuration shall not happen outside the UL carrier configuration delay which is 20ms in this test, and the length of interruption (0.125 ms after the start of T2) shall not exceed the length specified in clause TS 38.133 [6] 8.2.2.2.4.

6. When T2 expires the SS initiates *RRCReconfiguration* procedure to UE to release the NR UL of Cell2.

7. The UE:

a) Stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

and

b) Interruption of PCell due to UL carrier de-configuration shall not happen outside the UL carrier de-configuration delay which is 20ms in this test, and the length of interruption (0.125 ms after the start of T2) shall not exceed the length specified in clause TS 38.133 [6] 8.2.2.2.4.

8. Repeat step 2-7 until a test verdict has been achieved.  
The UL carrier configuration delay along with length of PCell interruption and UL carrier de-configuration delay along with length of PCell interruption 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 clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

7.5.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.

7.5.11.1.5 Test requirement

The UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

The UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

During T2 and T3, the start of interruption of PCell due to UL carrier configuration or de-configuration on SCell shall not happen outside the UL carrier configuration delay which is 20ms in this test, and the length of interruption shall not exceed the length specified in 38.133 [6] clause 8.2.2.2.4.

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%.

Table 7.5.11.1.5-1: NR Cell specific test parameters for SA UE UL carrier RRC reconfiguration Delay for FR2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.9 | | | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | Rough | | |
| Frequency Range | |  | Config 1 | FR2 | | | FR2 | | |
| NR RF Channel Number | |  | Config 1 | 1 | | | 2 | | |
| Duplex mode | |  | Config 1 | TDD | | | TDD | | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated | |  | Config 1 | 66 | | | 66 | | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP |  | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | DLBWP.1.1 | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | ULBWP.1.1 | | |
| OCNG Patterns | |  | Config 1 | OP.1 | | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| SSB configuration | |  | Config 1 | SSB.1 FR2 | | | SSB.1 FR2 | | |
| SMTC configuration | |  | Config 1 | SMTC.1 | | | SMTC.1 | | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| TCI state | |  | Config 1 | TCI.State.0 | | | TCI.State.0 | | |
| PUSCH parameters for NR UL carrier | |  | Config 1 | N/A | | | N/A | G-FR2-A3-4 in [28] | N/A |
| PUCCH parameters for NR UL carriers | |  | Config 1 | N/A | | | N/A | Table 11.3.2.3.1.2-2 in [28] | N/A |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 | Config 1 | -104.7 | | | -104.7 | | |
| Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | | -95.7 | | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -88.7 | | | -88.7 | | |
|  | | dB | Config 1 | 7 | | | 7 | | |
|  | | dB | Config 1 | 7 | | | 7 | | |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.92 | | | -58.92 | | |
| Propagation Condition | |  | Config 1 | AWGN | | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3 [6], and does not limit UE implementation or test system implementation | | | | | | | | | |

## 7.6 Measurement procedures

### 7.6.1 Intra-frequency measurements

#### 7.6.1.0 Minimum conformance requirements

##### 7.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.2.5.1 and 9.2.5.2]

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

Where:

TPSS/SSS\_sync\_intr: it is the time period used in PSS/SSS detection given in table 7.6.1.0.1-1.

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 7.6.1.0.1-2.

CSSFintra: it is a carrier specific scaling factor and is determined according to CSSFoutside\_gap,i in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps.

Mpss/sss\_sync\_w/o\_gaps : For a UE supporting FR2 power class 1, Mpss/sss\_sync\_w/o\_gaps = 40. For a UE supporting power class 2, Mpss/sss\_sync\_w/o\_gaps = 24. For a UE supporting FR2 power class 3, Mpss/sss\_sync\_w/o\_gaps = 24. For a UE supporting FR2 power class 4, Mpss/sss\_sync\_w/o\_gaps =24

Mmeas\_period\_w/o\_gaps : For a UE supporting power class 1, Mmeas\_period\_w/o\_gaps = 40. For a UE supporting FR2 power class 2, Mmeas\_period\_w/o\_gaps = 24. For a UE supporting power class 3, Mmeas\_period\_w/o\_gaps = 24. For a UE supporting power class 4, Mmeas\_period\_w/o\_gaps = 24.

When intrafrequency SMTC is fully non-overlapping with measurement gaps or intrafrequency SMTC is fully overlapping with MGs, Kp=1.

When intrafrequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

For FR2 when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intra-frequency SMTC, Klayer1\_measurement= 1.5, otherwise Klayer1\_measurement=1.

Table 7.6.1.0.1-1: Time period for PSS/SSS detection (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement)x max(SMTC period, DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

Table 7.6.1.0.1-2: Measurement period for intra-frequency measurements without gaps (Frequency FR2)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra |
| No DRX | max(400ms, ceil(Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x max(SMTC period, DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mmeas\_period\_w/o\_gaps xKp x Klayer1\_measurement ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

[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] clause 10.1.2.1, 10.1.7.1 and 10.1.12.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH.This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T identify intra without index defined in TS 38.133 [6] clause 9.2.5.1.When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period than Tidentify intra without index defined in TS 38.133 [6] clause 9.2.5.1 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than TMeasurement\_Period, Intra provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.2]

The requirements given above 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 are fulfilled for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 9.2.2, 9.2.4.3, 9.2.5.1 and 9.2.5.2.

##### 7.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + TSSB\_measurement\_period\_intra ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 7.6.1.0.2-1.

TSSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 7.6.1.0.2-2.

CSSFintra: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in TS 38.133 [6] section 9.1.5.2.2 for measurement conducted within measurement gaps.

Mpss/sss\_sync\_with\_gaps : For a UE supporting FR2 power class 1, Mpss/sss\_sync with\_gaps=40. For a UE supporting FR2 power class 2, Mpss/sss\_sync with\_gaps =24. For a UE supporting FR2 power class 3, Mpss/sss\_sync with\_gaps =24. For a UE supporting power class 4, Mpss/sss\_sync with\_gaps =24

Mmeas\_period\_ with\_gaps: For a UE supporting power class 1, Mmeas\_period\_ with\_gaps =40. For a UE supporting power class 2, Mmeas\_period\_ with\_gaps =24. For a UE supporting power class 3, Mmeas\_period\_ with\_gaps =24. For a UE supporting power class 4, Mmeas\_period with\_gaps =24.

Table 7.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, Mpss/sss\_sync\_with\_gaps x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x Mpss/sss\_sync\_with\_gaps) x max(MGRP, SMTC period, DRX cycle))x CSSFintra |
| DRX cycle>320ms | Mpss/sss\_sync\_with\_gaps x max(MGRP, DRX cycle) x CSSFintra |

Table 7.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range FR2)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra |
| No DRX | max(400ms, Mmeas\_period with\_gaps x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x Mmeas\_period with\_gaps) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSFintra |
| DRX cycle>320ms | Mmeas\_period with\_gaps x max(MGRP, DRX cycle) x CSSFintra |

[TS 38.133 [6], clause 9.2.2]

The requirements given above 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 are fulfilled for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, 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 that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than Tidentify\_intra\_without\_index defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

#### 7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

7.6.1.1.1 Test purpose

The purpose of this test is to verify the UE’s ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the TDD intra-frequency cell search requirements defined in TS 38.133 clause 9.2.5.1 and 9.2.5.2

7.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.1.

7.6.1.1.4 Test description

7.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.1.4.1-1.

Table 7.6.1.1.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in non-DRX

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.1.1-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.1-2 | 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 7.6.1.1.4.1-2.

Table 7.6.1.1.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 below.

2. Message contents are defined in clause 7.6.1.1.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.1.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | Comment |
| Active cell |  | 1, 2 | PCell (Cell 1) |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration |  | 1, 2 | SMTC.1 |  |
| A3-Offset | dB | 1, 2 | 11 |  |
| 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 | OFF |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

7.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 and Table 7.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, 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 NR Cell 2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.1.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X 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. Where X is

- 2402 ms for UE supporting power class 1,

- 1442 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:  
- transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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.

7.6.1.1.4.3 Message contents

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

Table 7.6.1.1.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap 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  Table H.3.1-4 with A3-offset = -11dB  Table H.3.1-7 with Condition INTRA-FREQ |

7.6.1.1.5 Test requirement

Table 7.6.1.1.4.1-3, Table 7.6.1.1.5-1 and Table 7.6.1.1.5-2 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting without gap in non-DRX.

Table 7.6.1.1.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1 | 24 | | 24 | |
| 2 | 48 | | 48 | |
| 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 | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| 2 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states |  | 1, 2 | TCI.state.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| cellIndividualOffset | dB | 1~2 | N/A | | 16 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | | |

Table 7.6.1.1.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | | |
| T1 | T2 | T1 | | T2 |
| AoA setup |  | 1, 2 | Setup 3 defined in A.9.3 | | | | |
| AoA1 | | | AoA2 | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | |
| Es | dBm/SCS | 1 | -89 | | | -89 | |
| 2 | -86 | | | -86 | |
| BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | | -0.12 |
| SSB\_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | | -89 |
| 2 | -86 | -86 | -Infinity | | -86 |
|  | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | | -64.41 |
| 2 | -64.41 | -64.41 | -Infinity | | -64.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure 7.6.1.1.5-1 | | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,

- 1.44s for a UE supporting power class 2, 3 and 4

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.



Figure 7.6.1.1.5-1: Time multiplexed downlink transmissions (Config 1 example)

#### 7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX

Editor's Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.6.1.2.1 Test purpose

Ther purpose of this test is to verify the UE’s ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.2.

7.6.1.2.4 Test description

7.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.2.4.1-1.

Table 7.6.1.2.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in DRX

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.1.2-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.2-2 | 240 kHz SSB SCS, 100MHz 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 7.6.1.2.4.1-2.

Table 7.6.1.2.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3 below.

2. Message contents are defined in clause 7.6.1.2.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.2.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | | Comment |
| Test 1 | Test 2 |
| Active cell |  | 1, 2 | PCell (Cell 1) | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration |  | 1, 2 | SMTC.1 | |  |
| A3-Offset | dB | 1, 2 | 7Note 1 | |  |
| 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 | DRX.1 | DRX. 7 |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 10 | 52 |  |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | | |

7.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, 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 NR Cell 2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for sub-test 1 or less than Y ms for sub-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. Where X is

- 7202 for UE supporting power class 1,

- 4322 for UE supporting power class 2, 3 or 4.

and Y is

- 51202 for UE supporting power class 1,

- 30722 for UE supporting power class 2, 3 or 4.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:  
- transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.6.1.2.4.1-1 as appropriate.

7.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.1.2.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in 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 INTRA-FREQ  Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.7-1 with Condition DRX.1 for sub-test 1  Table H.3.7-1 with Condition DRX. 7 for sub-test 2  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 7.6.1.2-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |
| Specific message contents exceptions for Test Configuration 7.6.1.2-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

7.6.1.2.5 Test requirement

Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

Table 7.6.1.2.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | |
| 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 | |
| PDSCH RMC configuration |  | 1 | SR.3. 2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| 2 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| 2 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states |  | 1, 2 | TCI.state.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | | |

Table 7.6.1.2.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | 1, 2 | Setup 1 defined in A.9 | | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | |
| BB Note 5 | dB | 1, 2 | 3.51 | -1.60 | -Infinity | -1.60 |
| Note 2 | dBm/15 KHz | 1, 2 | -101.5 Note 6 | | | |
| Note 2 | dBm/SCS | 1 | -92.5 | | | |
|  |  | 2 | -89.5 | | | |
| SSB\_RPSS-RSRP | dBm/SCS | 1 | -88.47 | -88.47 | -Infinity | -88.47 |
| 2 | -85.47 | -85.47 | -Infinity | -85.47 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
|  | dBm/95.04MHz | 1 | -58.03 | -55.68 | -58.03 | -55.68 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including test tolerance given in Annex F.1.3.2 | | | | | | |

In Test 1 when DRX cycle length = 40 ms, the overall delay 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 on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

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 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 NR Cell 2.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms (sub-test 1) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_without\_index

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

For UE supporting power class 1, TPSS/SSS\_sync\_intra = 3600 ms, T SSB\_measurement\_period\_intra= 3600 ms,

For UE supporting power class 2, 3 or 4, TPSS/SSS\_sync\_intra = 2160 ms, T SSB\_measurement\_period\_intra= 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,

- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms (sub-test 2) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_without\_index

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

For UE supporting power class 1, TPSS/SSS\_sync\_intra = 25600 ms, T SSB\_measurement\_period\_intra= 25600 ms,

For UE supporting power class 2, 3 or 4, TPSS/SSS\_sync\_intra = 15360 ms, T SSB\_measurement\_period\_intra= 15360 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,

- X = 30722 for UE supporting power class 2, 3 or 4,

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%.

#### 7.6.1.3 NR SA FR2 event-triggered reporting with gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

7.6.1.3.1 Test purpose

The purpose of this test is to verify UE’s ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards and supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

7.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.3.

7.6.1.3.4 Test description

7.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.3.4.1-1.

Table 7.6.1.3.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in non-DRX

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.1.3-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.3-2 | 240 kHz SSB SCS, 100MHz 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 7.6.1.3.4.1-2.

Table 7.6.1.3.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap 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.5-1 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 6.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.6.1.3.4.1-3.

2. Message contents are defined in clause 7.6.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.3.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in non-DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | Comment |
| Active cell |  | 1, 2 | PCell (Cell 1) |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Gap type |  | 1, 2 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1, 2 | 40 |  |
| Measurement gap length | ms | 1, 2 | 6 |  |
| Measurement gap offset | ms | 1, 2 | 39 |  |
| SMTC configuration |  | 1, 2 | SMTC.1 |  |
| CSI-RS parameters |  | 1, 2 | CSI-RS.3.2 TDD |  |
| A3-Offset | dB | 1, 2 | -11 |  |
| 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 | OFF |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

7.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.3.4.1-3, Table 7.6.1.3.5-1 and Tavke 7.6.1.3.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, 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 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. 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 *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X 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. Where X is

- X = 3202 for UE supporting power class 1,

- X = 1922 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:  
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, 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.

7.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap 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 INTRA-FREQ and GAP NEEDED  Table H.3.1-4 with A3-offset = -11dB  Table H.3.1-6 with Condition gapUE and Pattern #0  Table H.3.1-7 with Condition INTRA-FREQ |

Table 7.6.1.3.4.3-2: MeasObjectNR (Step 3, test procedure)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| ssbSubcarrierSpacing | SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2 |  | 7.6.1.3-1, |
|  | SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2 |  | 7.6.1.3-2, |
| smtc1 | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry |  |  |
| CellsToAddMod[1] SEQUENCE { |  | entry 1 |  |
| physCellId | PhysCellId of Cell 2 |  |  |
| cellIndividualOffset SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB16 |  |  |
| rsrqOffsetSSB | Not present |  |  |
| sinrOffsetSSB | Not present |  |  |
| rsrpOffsetCSI-RS | Not present |  |  |
| rsrqOffsetCSI-RS | Not present |  |  |
| sinrOffsetCSI-RS | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 7.6.1.3.4.3-3: *ServingCellConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } |  |  |  |
| } |  |  |  |

7.6.1.3.5 Test requirement

Table 7.6.1.3.4.1-3 and Table 7.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in non-DRX test.

Table 7.6.1.3.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| 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 | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| 2 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| 2 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states |  | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| cellIndividualOffset | dB | 1,2 | N/A | | 16 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | | |

Table 7.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | 1, 2 | Setup 3 defined in A.9 | | | |
|  |  |  | AoA1 | | AoA2 | |
| Beam AssumptionNote 4 |  | 1,2 | Rough | | Rough | |
| Es | dBm/SCS | 1 | -89 | | -89 | |
| 2 | -86 | | -86 | |
| BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB\_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
|  |  | 2 | -86 | -86 | -Infinity | 86 |
|  | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| 2 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1,2 | Defined in Figure 7.6.1.3.5-1 | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

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.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_without\_index

Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + TSSB\_measurement\_period\_intra

For UE supporting power class 1, TPSS/SSS\_sync\_intr = 1600 ms, T SSB\_measurement\_period\_intra= 1600 ms,

For UE supporting power class 2, 3 or 4, TPSS/SSS\_sync\_intr = 960 ms, T SSB\_measurement\_period\_intra= 960 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of X ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty), where

X = 3202 for UE supporting power class 1,

X = 1922 for UE supporting power class 2, 3 or 4,

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.

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%.



Figure 7.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1 example)

#### 7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case is complete for the following configurations:

* Test frequency f ≤ 40.8 GHz
* UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.6.1.4.1 Test purpose

The purpose of this test is to verify UE’s ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2, CSI-RS based RLM and long DRX cycle.

7.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.4.

7.6.1.4.4 Test description

7.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.4.4.1-1.

Table 7.6.1.4.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in DRX

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.1.4-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.4-2 | 240 kHz SSB SCS, 100MHz 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 7.6.1.4.4.1-2.

Table 7.6.1.4.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap 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.5-1 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 7.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 7.6.1.4.4.1-3.

2. Message contents are defined in clause 7.6.1.4.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.4.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | | Comment |
| Test 1 | Test 2 |
| Active cell |  | 1, 2 | PCell (Cell 1) | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| Gap type |  | 1, 2 | Per-UE gaps | |  |
| Measurement gap repitition periodicity | ms | 1, 2 | 40 | |  |
| Measurement gap length | ms | 1, 2 | 6 | |  |
| Measurement gap offset | ms | 1, 2 | 39 | |  |
| SMTC configuration |  | 1, 2 | SMTC.1 | |  |
| CSI-RS parameters |  | 1, 2 | CSI-RS.3.2 TDD | |  |
| A3-Offset | dB | 1, 2 | -7Note1 | |  |
| 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 | DRX.1 | DRX. 7 |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 10 | 52 |  |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | | |

7.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.4.4.1-3 and Table 7.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, 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 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y 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. Where X and Y is

- X = 7202, Y = 51202 for UE supporting power class 1,

- X = 4322, Y = 30722 for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:  
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),  
or  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, 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 7.6.1.4.4.1-3 as appropriate.

7.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.1.4.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting with gap in 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 INTRA-FREQ and GAP NEEDED  Table Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-6 with Condition gapUE and Pattern #0  Table H.3.1-7 with Condition INTRA-FREQ  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 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

|  |  |
| --- | --- |
| Specific message contents exceptions for Test Configuration 7.6.1.4-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |
| Specific message contents exceptions for Test Configuration 7.6.1.4-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

Table 7.6.1.4.4.3-2: *ServingCellConfig*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } |  |  |  |
| } |  |  |  |

|  |  |
| --- | --- |
| Condition | Explanation |
| BWP-Id1 | Active BWP (BWP2) |

7.6.1.4.5 Test requirement

Table 7.6.1.4.4.1-3 , Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in DRX test.

Table 7.6.1.4.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | |
| 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 | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| 2 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| 2 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state |  | 1, 2 | TCI.State.2 | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | | |

Table 7.6.1.4.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | 1, 2 | Setup 1 defined in A.9.1 | | | |
| Beam AssumptionNote 4 |  | 1,2 | Rough | | | |
| BB Note 5 | dB | 1, 2 | 3.51 | -1.60 | -Infinity | -1.60 |
| Note 2 | dBm/15 KHz | 1, 2 | -101.5Note 6 | | | |
| Note 2 | dBm/SCS | 1 | -92.5 | | | |
| 2 | -89.5 | | | |
| SSB\_RPSS-RSRP | dBm/SCS | 1 | -88.47 | -88.47 | -Infinity | -88.47 |
|  |  | 2 | -85.47 | -85.47 | -Infinity | -85.47 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
|  | dBm/95.04MHz | 1 | -58.03 | -55.68 | -58.03 | -55.68 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: Including test tolerance given in Annex F.1.3.2 | | | | | | |

In Test 1 when DRX cycle length = 40 ms is used, the overall delay 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 on PUSCH.

In Test 2 when DRX cycle length = 640 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report on PUSCH.

For both tests:

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 1: The actual overall delays measured in the test may be up to one DRX cycle higher than the measurement reporting delays above because UE is allowed to delay the initiation of the measurement reporting procedure to the next until the Active Time.

NOTE 2: In order to calculate the rate of correct events the system simulator shall verify that it has received correct Event A3 measurement report.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_without\_index

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

For UE supporting power class 1, TPSS/SSS\_sync\_intra = 7200ms, T SSB\_measurement\_period\_intra= 7200 ms,

For UE supporting power class 2, 3 or 4, TPSS/SSS\_sync\_intra = 2160 ms, T SSB\_measurement\_period\_intra= 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,

- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = Tidentify\_intra\_without\_index

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

For UE supporting power class 1, TPSS/SSS\_sync\_intra = 25600 ms, T SSB\_measurement\_period\_intra= 25600 ms,

For UE supporting power class 2, 3 or 4, TPSS/SSS\_sync\_intra = 15360 ms, T SSB\_measurement\_period\_intra= 15360 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,

- X = 30722 for UE supporting power class 2, 3 or 4,

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%.

### 7.6.2 Inter-frequency measurements

#### 7.6.2.0 Minimum conformance requirements for Inter-frequency measurements

Same as clause 5.6.2.0.

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.

#### 7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.1.

7.6.2.1.4 Test description

7.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.1.4.1-1.

Table 7.6.2.1.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.2.1-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

Table 7.6.2.1.4.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 5.2 for PC1; 3.5 for other PC |  |

Table 7.6.2.1.4-3: Test Environment parameters for SA 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 7.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9 The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.1.4.1-2 is provided for UE that supports 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 2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.1.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:

- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

12. Repeat step 1-11 for each sub-test in Table 7.6.2.1.4.1-2 as appropriate.

7.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.1.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection 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 Conditions GAP NEEDED and INTER-FREQ  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4 with A3-offset = -11dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #13  Table H.3.1-7 with Condition INTER-FREQ |

Table 7.6.2.1.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| offsetMO SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB16 |  |  |
| } |  |  |  |

7.6.2.1.5 Test requirement

Table 7.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | | Cell 2 | |
| T1 | T2 | | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 3 as specified in clause A.9 | | | | |
| AoA1 | | | AoA2 | |
| Assumption for UE beamsNote 7 | |  | Config 1,2 | Rough | | | Rough | |
| NR RF Channel Number | |  | Config 1 | 1 | | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | N/A | |
| OCNG Patterns | |  | Config 1 | OP.1 | | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | | - | |
| SMTC configuration | |  | Config 1 | SMTC.1 | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | | N/A | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | | N/A | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 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) | |  |
| Ês | | dBm/SCS | Config 1 | -87 | | -87 | -Infinity | -87 |
| SSB-RP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | | -Infinity | -87 |
| BBNote 8 | | dB | Config 1 | 1.89 | 1.89 | | -Infinity | 1.89 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | | -Infinity | -58.01 |
| Propagation Condition | |  | Config 1 | 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: Void  Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

The UE is not required to report SSB time index. 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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

#### 7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.2.

7.6.2.2.4 Test description

7.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.2.4.1-1.

Table 7.6.2.2.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.2.2-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

Table 7.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| NR RF Channel Number |  | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 | |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -12 | | Value modified by TT |
| Hysteresis | dB | Config 1 | 0 | |  |
| CP length |  | Config 1 | Normal | |  |
| TimeToTrigger | s | Config 1 | 0 | |  |
| Filter coefficient |  | Config 1 | 0 | | L3 filtering is not used |
| DRX |  | Config 1 | DRX.1 | DRX.2 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | |  |
| T2 | s | Config 1 | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC |  |

Table 7.6.2.2.4-3: Test Environment parameters for SA 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 7.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.2.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration #13 as defined in Table 7.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and for UE that supports 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 2.

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 NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.2.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.2.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.2.2.4.1-2 as appropriate.

7.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.2.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in 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 Conditions GAP NEEDED and INTER-FREQ  Table H.3.1-3 with Conditions INTER-FREQ MO and and Synchronous cells  Table H.3.1-4 with A3-offset = -12dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #13  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2 |

7.6.2.2.5 Test requirement

Table 7.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | |
| T1 | T2 | T1 | | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.9 | | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | | |
| Duplex mode | |  | Config 1 | TDD | | TDD | | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | | |
| OCNG Patterns | |  | Config 1 | OP.1 | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | | |
| SMTC configuration | |  | Config 1 | SMTC.1 | | SMTC.1 | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 |  | -104.7 | | -104.7 | | |
| Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | | -86.7 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | | 9 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | | 9 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | | -57.2 |
| Propagation Condition | |  | Config 1 | AWGN | | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index.

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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2.

#### 7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.3.

7.6.2.3.4 Test description

7.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.3.4.1-1.

Table 7.6.2.3.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.2.3-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

Table 7.6.2.3.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 for PC1; 4.5 for other PC |  |

Table 7.6.2.3.4-3: Test Environment parameters for SA 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 7.6.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.3.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.2.3.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.3.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.3.4.1-2 is provided for UE that supports 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 2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.3.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.3.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.10. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

12. Repeat step 1-11 for each sub-test in Table 7.6.2.3.4.1-2 as appropriate.

7.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.3.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection 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 Conditions GAP NEEDED and INTER-FREQ  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4 with Condition SSB Index and A3-offset = -11dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #13  Table H.3.1-7 with Condition INTER-FREQ |

Table 7.6.2.3.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| offsetMO SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB16 |  |  |
| } |  |  |  |

7.6.2.3.5 Test requirement

Table 7.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | | Cell 2 | |
| T1 | T2 | | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 3 as specified in clause A.9 | | | | |
| AoA1 | | | AoA2 | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | Rough | |
| NR RF Channel Number | |  | Config 1 | 1 | | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | N/A | |
| OCNG Patterns | |  | Config 1 | OP.1 | | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | | - | |
| SMTC configuration | |  | Config 1 | SMTC.1 | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | | N/A | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | | N/A | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 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) | |  |
| Ês | | dBm/SCS | Config 1 | -87 | | -87 | -Infinity | -87 |
| SSB-RP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | | -Infinity | -87 |
| BBNote 8 | | dB | Config 1 | 1.89 | 1.89 | | -Infinity | 1.89 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | | -Infinity | -58.01 |
| Propagation Condition | |  | Config 1 | 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: Void  Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

The UE is required to report SSB time index. 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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

#### 7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.4.

7.6.2.4.4 Test description

7.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.4.4.1-1.

Table 7.6.2.4.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.2.4-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

Table 7.6.2.4.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| **Test 1** | **Test 2** |
| NR RF Channel Number |  | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 | |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -12 | | Value modified by TT |
| Hysteresis | dB | Config 1 | 0 | |  |
| CP length |  | Config 1 | Normal | |  |
| TimeToTrigger | s | Config 1 | 0 | |  |
| Filter coefficient |  | Config 1 | 0 | | L3 filtering is not used |
| DRX |  | Config 1 | DRX.1 | DRX.2 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | |  |
| T2 | s | Config 1 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC |  |

Table 7.6.2.4.4-3: Test Environment parameters for SA 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 7.6.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.4.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.4.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table 7.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and for UE that supports 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 2.

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 NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.4.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.4.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.2.4.4.1-2 as appropriate.

7.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.4.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in 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 Conditions GAP NEEDED and INTER-FREQ  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4 with Condition SSB Index and A3-offset = -12dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #13  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2 |

7.6.2.4.5 Test requirement

Table 7.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.4.5-1: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.9 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration | |  | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 |  | -104.7 | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 , the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1 2 UE is required to report SSB time index. 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%.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2.

#### 7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.5.

7.6.2.5.4 Test description

7.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.5.4.1-1.

Table 7.6.2.5.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Description of serving cell | Description of target cell |
| 7.6.2.5-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.5-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 7.6.2.5-3 | NR 30kHz 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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

Table 7.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | One NR FR1 and one NR FR2 carrier frequency is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1 in FR1 |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2 in FR2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | Gap not configured | As specified in TS 38.133 [6]clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | N/A |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | As specified in clause A.3.1 |
|  | Config 2 | SSB.1 FR1 | | As specified in clause A.3.1 |
|  | Config 3 | SSB.2 FR1 | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | |  |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | |  |
| CP length |  | Config 1,2,3 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 5.2 for PC1; 3.5 for other PC | 3 for PC1; 2 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

Table 7.6.2.5.4-3: Test Environment parameters for SA 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 7.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.5.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.5.4.1-2 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 NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.5.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.5.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and 2562 ms for UE supporting power class 1, or 1602 ms for UE supporting other power class 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.2.5.4.1-2 as appropriate.

7.6.2.5.4.3 Message contents

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

Table 7.6.2.5.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection 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 Conditions GAP NEEDED and INTER-FREQ for Test 1  Table H.3.1-2 with Condition INTER-FREQ for Test 2  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4AA with A4-threshold= -105dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1  Table H.3.1-7 with Condition INTER-FREQ |

Table 7.6.2.5.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| offsetMO SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB6 |  |  |
| } |  |  |  |

7.6.2.5.5 Test requirement

Table 7.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.5.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | |
|  | |  |  | T1 | T2 | T1 | T2 | |
| AoA setup | |  | Config 1,2,3 | N/A | | Setup 1 as specified in clause A.9 | | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | | |
| Duplex mode | |  | Config 1 | FDD | | TDD | | |
|  | |  | Config 2,3 | TDD | | TDD | | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | | |
|  | |  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | | |
|  | |  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | | |
|  | |  | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | | |
|  | |  | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | | |
|  | |  | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | | |
|  | |  | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | | |
| OCNG Patterns | |  | Config 1,2,3 | OP.1 | | OP.1 | | |
| PDSCH Reference | |  | Config 1 | SR.1.1 FDD | | - | | |
| measurement channel | |  | Config 2 | SR.1.1 TDD | |  | | |
|  | |  | Config 3 | SR.2.1 TDD | |  | | |
| RMSI CORESET Reference | |  | Config 1 | CR.1.1 FDD | | - | | |
| Channel | |  | Config 2 | CR.1.1 TDD | |  | | |
|  | |  | Config 3 | CR.2.1 TDD | |  | | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | CCR.3.1 TDD | | |
|  | Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | | |
|  | Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | | |
| SMTC configuration | |  | Config 1 | SMTC.2 | | SMTC.2 | | |
|  | |  | Config 2,3 | SMTC.1 | | SMTC.1 | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | | |
|  | |  | Config 3 | 30 | | 120 | | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1,2,3 | 0 | | 0 | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | | |
| Ês | | dBm/SCS | Config 1,2,3 |  | | -Infinity | | -87 |
| SSB\_RP Note 3 | | dBm/SCS | Config 1,2 |  | | -Infinity | -87 | |
|  | | Note5 | Config 3 |  | | -Infinity | -87 | |
| BB Note 8 | | dB | Config 1,2,3 | NA  Link only, see clause | | -Infinity | 14.69 | |
|  | | dBm/95.04 MHz Note5 | Config 1,2,3 | A.3.7A | | -Infinity | -58.01 | |
| Propagation Condition | |  | Config 1,2,3 | 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: Void  Note 3: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |

In test 1 with per-UE gap the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 2, without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

2560 for UE supporting power class 1, or

1600 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. 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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms for power class 1 UE and 3202 ms for other power classes in test 1 and 2562 for power class 1 UE and 1602 ms for other power classes in test 2.

#### 7.6.2.6 NR SA FR1-FR2 event-triggered reporting in DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.6.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.6.

7.6.2.6.4 Test description

7.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.6.4.1-1.

Table 7.6.2.6.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Description of serving cell | Description of target cell |
| 7.6.2.6-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.6-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 7.6.2.6-3 | NR 30kHz 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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

Table 7.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | | | Two NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | | Gap not configured | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | | N/A | |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
|  | Config 2 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
|  | Config 3 | SSB.2 FR1 | | | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | | | |  |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | | | |  |
| CP length |  | Config 1,2,3 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | DRX.1 | DRX.2 | DRX.1 | DRX.2 | DRX is used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | | |  |
| T2 | s | Config 1,2,3 | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

Table 7.6.2.6.4-3: Test Environment parameters for SA 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 7.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.7.6.2.6.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.6.4.1-2 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 NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.6.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.6.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.2.6.4.1-2 as appropriate.

7.6.2.6.4.3 Message contents

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

Table 7.6.2.6.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in 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 Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2  Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4AA with A4-threshold= -105dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4 |

Table 7.6.2.6.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| offsetMO SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB6 |  |  |
| } |  |  |  |

7.6.2.6.5 Test requirement

Table 7.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1,2,3 | NA | | Setup 1 as specified in clause A.9 | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | |  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | |  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | |  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | |  | Config 2 | SR.1.1 TDD | |  | |
|  | |  | Config 3 | SR2.1 TDD | |  | |
| RMSI CORESET Reference Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | |  | Config 2 | CR.1.1 TDD | |  | |
|  | |  | Config 3 | CR2.1 TDD | |  | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | CCR.3.1 TDD | |
|  | Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | |
|  | Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | |  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
|  | |  | Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | NA  Link only, see clause A.3.7A | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1,2 |  | | -95.7 | |
|  | |  | Config 3 |  | | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1,2 |  | | -Infinity | -86.7 |
|  | |  | Config 3 |  | | -Infinity | -86.7 |
|  | | dB | Config 1,2,3 |  | | -Infinity | 9 |
|  | | dB | Config 1,2,3 |  | | -Infinity | 9 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 |  | | - | - |
|  | | dBm/38.16MHz | Config 3 |  | | - | - |
|  | | dBm/95.04 MHz Note5 | Config 1,2,3 |  | | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1,2,3 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone | | | | | | | |

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. 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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and test 3 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2 and test 4.

#### 7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.7.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.7.

7.6.2.7.4 Test description

7.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.7.4.1-1.

Table 7.6.2.7.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Description of serving cell | Description of target cell |
| 7.6.2.7-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.7-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 7.6.2.7-3 | NR 30kHz 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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

Table 7.6.2.7.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | Two NR carrier frequencies is used |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | Gap not configured | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset |  | Config 1,2,3 | 39 | N/A |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | As specified in clause A.3.1 |
|  | Config 2 | SSB.1 FR1 | | As specified in clause A.3.1 |
|  | Config 3 | SSB.2 FR1 | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | |  |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | |  |
| CP length |  | Config 1,2,3 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 7 for PC1; 4.5 for other PC | 3.5 for PC1; 2.5 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

Table 7.6.2.7.4.1-3: Test Environment parameters for SA 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 7.6.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.7.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.7.4.2 Test procedure

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.7.4.1-2 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 NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.7.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.7.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and 3362 ms for UE supporting power class 1, or 2082 ms for UE supporting other power class 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.2.7.4.1-2 as appropriate.

7.6.2.7.4.3 Message contents

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

Table 7.6.2.7.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection 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 Conditions GAP NEEDED and INTER-FREQ for Test 1  Table H.3.1-2 with Condition INTER-FREQ for Test 2  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1  Table H.3.1-7 with Condition INTER-FREQ |

Table 7.6.2.7.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| offsetMO SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB6 |  |  |
| } |  |  |  |

7.6.2.7.5 Test requirement

Table 7.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.7.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1,2,3 | NA | | Setup 1 as specified in clause A.9 | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | |  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | |  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | |  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference | |  | Config 1 | SR.1.1 FDD | | - | |
| measurement channel | |  | Config 2 | SR.1.1 TDD | |  | |
|  | |  | Config 3 | SR.2.1 TDD | |  | |
| RMSI CORESET Reference | |  | Config 1 | CR.1.1 FDD | | - | |
| Channel | |  | Config 2 | CR.1.1 TDD | |  | |
|  | |  | Config 3 | CR.2.1 TDD | |  | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | CCR.3.1 TDD | |
|  | Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | |
|  | Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | |  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Ês | | dBm/SCS | Config 1,2, 3 |  | | -Infinity | -87 |
| SSB\_RP Note 3 | | dBm/SCS | Config 1,2 |  | | -Infinity | -87 |
|  | | Note5 | Config 3 |  | | -Infinity | -87 |
| BB Note 8 | | dB | Config 1,2,3 | NA  Link only, see clause | | -Infinity | 14.69 |
|  | | dBm/95.04 MHz Note5 | Config 1,2,3 | A.3.7A | | Infinity | -58.01 |
| Propagation Condition | |  | Config 1,2,3 | 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: Void  Note 3: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

In test 1 with per-UE gap , the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 2 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

3360 for UE supporting power class 1, or

2080 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. 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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms for power class 1 UE and 4162 ms for other power classes in test 1 and 3362 for power class 1 UE and 2082 ms for other power classes in test 2

#### 7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.8.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.8.

7.6.2.8.4 Test description

7.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.8.4.1-1.

Table 7.6.2.8.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Description of serving cell | Description of target cell |
| 7.6.2.8-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.8-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 7.6.2.8-3 | NR 30kHz 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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

Table 7.6.2.8.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | | | Two NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | | Gap not configured | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | | N/A | |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
|  | Config 2 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
|  | Config 3 | SSB.2 FR1 | | | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | | | |  |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | | | |  |
| CP length |  | Config 1,2,3 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | DRX.1 | DRX.2 | DRX.1 | DRX.2 | DRX is used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | | |  |
| T2 | s | Config 1,2,3 | 11 for PC1; 6.5 for other PCTBD | 108 for PC1; 67 for other PCTBD | 11 for PC1; 6.5 for other PCTBD | 108 for PC1; 67 for other PCTBD | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

Table 7.6.2.8.4-3: Test Environment parameters for SA 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 7.6.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.2.8.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.8.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.8.4.1-2 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 NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.8.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.8.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.2.8.4.1-2 as appropriate.

7.6.2.8.4.3 Message contents

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

Table 7.6.2.8.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in 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 Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2  Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4 |

Table 7.6.2.8.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { |  |  |  |
| offsetMO SEQUENCE { |  |  |  |
| rsrpOffsetSSB | dB6 |  |  |
| } |  |  |  |

7.6.2.8.5 Test requirement

Table 7.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.8.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1,2,3 | NA | | Setup 1 as specified in clause A.9 | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | |  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | |  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | |  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
|  | |  | Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference | |  | Config 1 | SR.1.1 FDD | | - | |
| measurement channel | |  | Config 2 | SR.1.1 TDD | |  | |
|  | |  | Config 3 | SR2.1 TDD | |  | |
| RMSI CORESET Reference | |  | Config 1 | CR.1.1 FDD | | - | |
| Channel | |  | Config 2 | CR.1.1 TDD | |  | |
|  | |  | Config 3 | CR2.1 TDD | |  | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | CCR.3.1 TDD | |
|  | Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | |
|  | Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | |  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
|  | |  | Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  |  | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1,2 |  | | -95.7 | |
|  | |  | Config 3 |  | | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1,2 |  | | -Infinity | -86.7 |
|  | |  | Config 3 |  | | -Infinity | -86.7 |
|  | | dB | Config 1,2,3 | NA  Link only, see clause | | -Infinity | 9 |
|  | | dB | Config 1,2,3 | A.3.7A | | -Infinity | 9 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 |  | | - | - |
|  | | dBm/38.16MHz | Config 3 |  | | - | - |
|  | | dBm/95.04 MHz Note5 | Config 1,2,3 |  | | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1,2,3 |  | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. 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%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6240 ms for other power classes in test 1 and test 3 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2 and test 4.

### 7.6.3 L1-RSRP measurement for beam reporting

#### 7.6.3.0 Minimum conformance requirements for L1-RSRP measurement for beam reporting

##### 7.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.1

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.

##### 7.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.2

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.

#### 7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.1.1 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.

7.6.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.1.

7.6.3.1.4 Test description

7.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.1.4.1-1.

Table 7.6.3.1.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in non-DRX supported test configurations

|  |  |
| --- | --- |
| **Test Case ID** | **Description** |
| 7.6.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.3.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 7.6.3.1.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
|  | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| 2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| 2 | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| 2 | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | Off |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~2 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 7.6.3.1.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement 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 7.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.3.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.3.1.4.1-2. 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 NR SA, 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 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.3.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.3.1.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

- R1: the UE shall start to transmit valid L1-RSRP reports no later than 1760ms for UE supporting power class 1 in configuration 1, no later than 1720 ms for UE supporting power class 1 in configuration 2, no later than 1280 ms for UE supporting power class other than 1 in configuration 1 and no later than 1240 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2. If the first valid report is received before 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 L1-RSRP reports every 320 slots. 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 corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 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 corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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.

7.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.3.1.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement 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  Table H.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with condition SSB |

Table 7.6.3.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.6.3.1.5 Test requirement

Table 7.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.1.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  |  | Setup 1 according to A.9 | | | |
| Assumption for UE beamsNote 4 | 1~2 |  | Rough | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
| 2 | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 2 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| 2 | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1

- 1200 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations.

Table 7.6.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

Table 7.6.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

Table 7.6.3.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)

|  |  |  |
| --- | --- | --- |
|  | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

#### 7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

7.6.3.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.2.

7.6.3.2.4 Test description

7.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.2.4.1-1.

Table 7.6.3.2.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in DRX supported test configurations

|  |  |
| --- | --- |
| **Test Case ID** | **Description** |
| 7.6.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.3.2-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 7.6.3.2.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| 2 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| 2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| 2 | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| 2 | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | DRX.3 |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 3 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~2 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 7.6.3.2.4-3: Test Environment parameters for NR SA FR2 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 7.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.3.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.2.4.2 Test procedure

Same as in 7.6.3.1.4.2 with the following exception:

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

- R1: the UE shall start to transmit valid L1-RSRP reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2. If the first valid report is received before 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 L1-RSRP reports every 320 slots. 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 corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configurations 3 and 4 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 corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.6.3.2.4.3 Message contents

Same message content as in subclause 7.6.3.1.4.3 with the following exception:

Table 7.6.3.2.4.3-1: Common Exception messages NR SA FR2 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.3.1-1  Table H.3.1-2  Table H.3.7-1 with condition DRX.3 |

7.6.3.2.5 Test requirement

Table 7.6.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.2.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **SSB#0** | | **SSB#1** | |
| **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration |  |  | Setup 1 according to A.9 | | | |
| Assumption for UE beamsNote 4 | 1~2 |  | Rough | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
| 2 | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 2 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| 2 | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1

- 1920 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations.

Table 7.6.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

Table 7.6.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

Table 7.6.3.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)

|  |  |  |
| --- | --- | --- |
|  | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

#### 7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.3.1 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 9.5.4.2.

7.6.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.3.

7.6.3.3.4 Test description

7.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.3.4.1-1.

Table 7.6.3.3.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.3.4-1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Table 7.6.3.3.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| CSI-RS configuration | 1 |  | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| DRX configuration | 1 |  | Off |
| reportConfigType | 1 |  | aperiodic |
| reportQuantity | 1 |  | cri-RSRP |
| Number of reported RS | 1 |  | 2 |
| qcl-Info | 1 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1 |  | 8 |
| Propagation condition | 1 |  | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 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 7.6.3.3.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement 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 7.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.3.4.2 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 PCell. 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 7.6.3.3.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.3.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 1.

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 7.6.3.3.5-2 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 7.6.3.3.5-4 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.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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.

7.6.3.3.4.3 Message contents

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

Table 7.6.3.3.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement 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  Table H.3.6-2 with conditions APERIODIC and CSI-RSRP  Table H.3.6-3 with conditions CSI-RS and APERIODIC |

Table 7.6.3.3.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

7.6.3.3.5 Test requirement

Table 7.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.3.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1 |  | Setup 1 according to A.9 | |
| Note1 | 1 | dBm/15kHz | -105 | |
| Note1 | 1 | dBm/SSB SCS | -95.97 | |
|  | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1 | dB | 0 | 9 |
| Note 1: Void  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 480ms 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 7.6.3.3.5-2 the corresponding relative accuracy requirements in Table 7.6.3.3.5-3.

Table 7.6.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values R2

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 40 |
| Highest reported value (CSI-RS#1) | 99 |

Table 7.6.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values R3

|  |  |
| --- | --- |
|  | T1 |
| Lowest DIFF RSRP reported (CSI-RS#0) | 1 |
| Highest DIFF RSRP reported (CSI-RS#0) | 7 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

7.6.3.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.4.

7.6.3.4.4 Test description

7.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.4.4.1-1.

Table 7.6.3.4.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.3.4-1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Table 7.6.3.4.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| CSI-RS configuration | 1 |  | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| DRX configuration | 1 |  | DRX.3 |
| reportConfigType | 1 |  | aperiodic |
| reportQuantity | 1 |  | cri-RSRP |
| Number of reported RS | 1 |  | 2 |
| qcl-Info | 1 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1 |  | 8 |
| Propagation condition | 1 |  | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 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 7.6.3.4.4-3: Test Environment parameters for NR SA FR2 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 7.6.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.3.4.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.4.4.2 Test procedure

Same test procedure as in subclause 7.6.3.3.4.2 with tables 7.6.3.3.4.1-2 and 7.6.3.3.5-1 replaced by tables 7.6.3.4.4.1-2 and 7.6.3.4.5-1 and following change in step 3.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 1.

7.6.3.4.4.3 Message contents

Same message content as in subclause 7.6.3.3.4.3 with the following exception:

Table 7.6.3.4.4.3-1: Common Exception messages NR SA FR2 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.3.1-1  Table H.3.1-2  Table H.3.7-1 with condition DRX.3 |

7.6.3.4.5 Test requirement

Table 7.6.3.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.4.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1 |  | Setup 1 according to A.9 | |
| Assumption for UE beamsNote 3 | 1~2 |  | Rough | |
| Note1 | 1 | dBm/15kHz | -105 | |
| Note1 | 1 | dBm/SSB SCS | -95.97 | |
|  | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1 | dB | 0 | 9 |
| Note 1: Void  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 1440ms 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 7.6.3.4.5-2 the corresponding relative accuracy requirements in Table 7.6.3.4.5-3.

Table 7.6.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 40 |
| Highest reported value (CSI-RS#1) | 99 |

Table 7.6.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values

|  |  |
| --- | --- |
|  | T1 |
| Lowest DIFF RSRP reported (CSI-RS#0) | 1 |
| Highest DIFF RSRP reported (CSI-RS#0) | 7 |

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 7.6.4 CLI measurements

#### 7.6.4.0 Minimum conformance requirements

##### 7.6.4.0.1 Minimum conformance requirements for SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of TSRS\_RSRP\_measurement\_period for FR1 and FR2.

Table 7.6.4.0.1‑1 Measurement period TSRS\_RSRP\_measurement\_period

|  |  |
| --- | --- |
| Configuration | TSRS\_measurement\_period (ms) |
| No DRX | Max(60, 3 X TSRS) |
| DRX cycle ≤ 320ms | Max(60, Ceil(1.5 X 3) X max(TSRS, TDRX)) |
| DRX cycle > 320ms | 3 X TDRX |
| Note: TSRS is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and TDRX is the DRX cycle length. | |

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for TSRS\_RSRP\_measurement\_period.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements as 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 for FR1 and FR2 for a corresponding band,

- SRS\_RP and SRS Ês/Iot according to Annex B.2.7 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 for FR1 and FR2.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and 9.7.2.1, 9.7.2.2 and 9.7.2.3

#### 7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.

- MU/TT analysis for UE power class other than PC3 is incomplete.

- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

7.6.4.1.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of SRS-RSRP measurement in non-DRX within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5

7.6.4.1.2 Test applicability

FFS

7.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.1.

7.6.4.1.4 Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

7.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.1.4.1-1.

Table 7.6.4.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.6.4.1 - 1 | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.1.4.1-2.

Table 7.6.4.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters are given in Table 7.6.4.1.4.1-3 below.

2. Message contents are defined in clause 7.6.4.1.4.3.

3. One cell is deployed in the test, which is FR2 PCell (Cell 1).. The test parameters for PSCell is given in Table A.7.6.4.1.4.1-3

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 7.6.4.1.4.1-3: General test parameters for SRS-RSRP event triggered reporting for PCell in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | Cell 1 |  |
| RF Channel Number |  | 1 | 1: Cell 1 |  |
| SSB configuration |  | 1 | SSB.1 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| SRS configuration |  | 1 | SRSConf.1 | Table A.7.6.4.1.2-4 |
| CP length |  | 1 | Normal |  |
| i1-Threshold | dBm | 1 | -112 |  |
| Hysteresis | dB | 1 | 0 |  |
| Time To Trigger | s | 1 | 0 |  |
| Filter coefficient |  | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 | OFF | Non-DRX |
| Time offset between DL from serving cell and SRS from test system | μs | 1 | 10.67 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 1 |  |

7.6.4.1.4.2 Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

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.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.1.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.6.4.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 with event I1 configured..

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.6.4.1.4.3 Message contents

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

FFS

7.6.4.1.5 Test requirement

Table 7.6.4.1.5-1 defines the cell specific settings for all tests. Table 7.6.4.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.6.4.1.5-1: NR Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
|  |  |  | T1 | T2 |
| TDD configuration |  | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | |
| OCNG Patterns |  | 1 | OP.1 | |
| TRS configuration |  |  | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | |
| Propagation Condition |  | 1 | AWGN | |

Table 7.6.4.1.5-2: NR OTA Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell and neighbour cell UE in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Neighbour cell UE | |
|  |  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1 | Setup 1 defined in A.9.1 | | | |
| Beam assumption Note 4 |  | 1 | Fine | | | |
| Note 2 | dBm/15 kHz | 1 | ~~-98~~-100.5 | | ~~-98~~-100.5 | |
| Note 2 | dBm/SCS | 1 | -91.5 | | -91.5 | |
|  | dB | 1 | - | - | -infinity | 7 |
|  | dB | 1 | - | - | -infinity | 7 |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | - | - | -infinity | -84.5 |
| Io | dBm/95.04 MHz | 1 | -63.86 | -56.07 | -63.86 | -56.07 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Cell 2 doesn’t transmit during the SRS and the 2 previous symbols. Es/NoC is not applied to those symbols. | | | | | | |

Table7.6.4.1.5-3: SRS configuration for measurement reporting

|  |  |  |  |
| --- | --- | --- | --- |
|  | Field | SRSConf.1 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 |  |
|  | srs-ResourceIdList | 0 |  |
|  | resourceType | Periodic |  |
|  | Usage | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 |  |
|  | nrofSRS-Ports | Port1 |  |
|  | transmissionComb | n2 |  |
|  | combOffset-n2 | 0 |  |
|  | cyclicShift-n2 | 0 |  |
|  | resourceMapping  startPosition | 0 |  |
|  | resourceMapping  nrofSymbols | n1 |  |
|  | resourceMapping  repetitionFactor | n1 |  |
|  | freqDomainPosition | 0 |  |
|  | freqDomainShift | 0 |  |
|  | freqHopping  c-SRS | 12 |  |
|  | freqHopping  b-SRS | 0 |  |
|  | freqHopping  b-hop | 0 |  |
|  | groupOrSequenceHopping | Neither |  |
|  | resourceType | Periodic |  |
|  | periodicityAndOffset | sl40, 25 |  |
|  | sequenceId | 0 | Any 10 bit number |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 7.6.4.2 NR SA FR2 CLI-RSSI measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

##### 7.6.4.2.1 Test purpose

The purpose of this test case is 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

##### 7.6.4.2.2 Test applicability

FFS

##### 7.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.2.

##### 7.6.4.2.4 Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

7.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.2.4.1-1.

Table 7.6.4.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI test

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.2.4.1-2.

Table 7.6.4.2.4.1-2: Initial conditions SA FR2 CLI-RSSI measurement 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. The test parameters are given in Table 7.6.4.2.4.1-3 below.

2. Message contents are defined in clause 7.6.4.2.4.3.

3. One cell is deployed in the test, which is FR2 PCell (Cell 1).. The test parameters for PSCell is given in Table 7.6.4.2.4.1-3

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 7.6.4.2.4.1-3: General test parameters for CLI-RSSI event triggered reporting for PCell in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | NR Cell 1 |  |
| RF Channel Number |  | 1 | 1: Cell 1 |  |
| SSB configuration |  | 1 | SSB.1 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| CLI-RSSI configuration |  | 1 | CLI-RSSIConf.1 | Table7.6.4.2.5-3 |
| CP length |  | 1 | Normal |  |
| i1-Threshold | dBm | 1 | -94.5 |  |
| Hysteresis | dB | 1 | 0 |  |
| Time To Trigger | s | 1 | 0 |  |
| Filter coefficient |  | 1 | 0 | L3 filtering is not used |
| DRX |  | 1 | OFF | Non-DRX |
| Time offset between DL from serving cell and OCNG from test system | μs | 1 | 10.67 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 1 |  |

7.6.4.2.4.2 Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

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.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.2.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.2.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.6.4.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 with event I1 configured..

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.6.4.2.4.3 Message contents

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

FFS

##### 7.6.4.2.5 Test requirement

Table 7.6.4.2.5-1 defines the cell specific settings for all tests. Table 7.6.4.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.6.4.2.5-1: : NR Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
|  |  |  | T1 | T2 |
| TDD configuration |  | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | |
| PUSCH parameters |  | 1 | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | |
| OCNG Patterns Note 1 |  | 1 | OP.1 | |
| TRS configuration |  |  | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | |
| Propagation Condition |  | 1 | AWGN | |
| Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

Table 7.6.4.2.5-2: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
|  |  |  | T1 | T2 |
| AoA setup |  | 1 | Setup 1 defined in A.9.1 | |
| Beam assumption Note 3 |  | 1 | Fine | Fine |
| on CLI-RSSI measurement resource Note 2 | dBm/15 kHz | 1 | -119+TT | -108+TT |
| on CLI-RSSI measurement resource Note 2 | dBm/SCS | 1 | -110 | -99 |
| Io on CLI-RSSI measurement resource | dBm/95.04 MHz | 1 | -81.01 | -70.01 |
| Io on CLI-RSSI measurement resource | dBm/1.08 MHz | 1 | -100.46 | -89.46 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | |

Table7.6.4.2.5-3: CLI-RSSI measurement resource configuration for measurement reporting

|  |  |  |
| --- | --- | --- |
|  | Field | CLI-RSSIConf.1 |
| RSSI-Resource | rssi-ResourceId | 0 |
|  | rssi-SCS | 120 |
|  | startPRB | 0 |
|  | nrofPRBs | 66 |
|  | startPosition | 3 |
|  | nrofSymbols | 11 |
|  | rssi-PeriodicityAndOffset | sl40, 25 |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 5ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 7.6.5

### 7.6.6 L1-SINR measurement for beam reporting

#### 7.6.6.0 Minimum conformance requirements

##### 7.6.6.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

Same as clause 5.6.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.

##### 7.6.6.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

Same as clause 5.6.5.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.3, 9.8.4.2 and 9.8.5.

##### 7.6.6.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

Same as clause 5.6.5.0.3

The normative reference for this requirement is TS 38.133 [6] clauses 99.8.3, 9.8.4.3 and 9.8.5.

#### 7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

7.6.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting L1-SINR measurement.

7.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.1.

7.6.6.1.4 Test description

7.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.1.4.1-1.

Table 7.6.6.1.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 7.6.6.1.4.1-2: General test parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| CSI-RS configuration | 1 |  | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| DRX configuration | 1 |  | Off |
| reportConfigType | 1 |  | aperiodic |
| reportQuantity | 1 |  | cri-SINR |
| reportQuantity-r16 | 1 |  | cri-SINR-r16 |
| Number of reported RS | 1 |  | 2 |
| qcl-Info | 1 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1 |  | 26 |
| Propagation condition | 1 |  | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 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 7.6.6.1.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and no 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 7.6.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.6.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.1.4.2 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 PCell. 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 7.6.6.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.6.1.5-1. T1 starts.

3. After 160ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. 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 7.6.6.1.5-2 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 7.6.6.1.5-3 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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.

7.6.6.1.4.3 Message contents

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

Table 7.6.6.1.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-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  Table H.3.6A-2 with conditions CSI-RS and APERIODIC |

Table 7.6.6.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

7.6.6.1.5 Test requirement

Table 7.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.1.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based L1-SINR measurement in non-DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1 |  | Setup 1 according to A.9.1 | |
| Beam assumptionNote 3 | 1 |  | Rough | |
| Note1 | 1 | dBm/15kHz | -105 | |
| Note1 | 1 | dBm/SSB SCS | -95.97 | |
|  | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note3 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1 | dB | 0 | 9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 160ms 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 7.6.6.1.5-2 the corresponding relative accuracy requirements in Table 7.6.6.1.5-3.

Table 7.6.6.1.5-2: L1-SINR absolute accuracy requirements for the reported values R2

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 51 |
| Highest reported value (CSI-RS#1) | 74 |

Table 7.6.6.1.5-3: L1-SINR relative accuracy requirements for the reported values R3

|  |  |
| --- | --- |
|  | T1 |
| Lowest DIFF SINR reported (CSI-RS#0) | 4 |
| Highest DIFF SINR reported (CSI-RS#0) | 13 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

7.6.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards, supporting long DRX cycle and L1-SINR measurement.

7.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.2.

7.6.6.2.4 Test description

7.6.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.2.4.1-1.

Table 7.6.6.2.4.1-1: Applicable NR configurations for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 7.6.6.2.4.1-2: General test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| 2 | SSB.2 FR2 |
| CSI-IM configuration | 1~2 |  | CSI-IM.3.1 TDD |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | DRX.3 |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity-r16 | 1~2 |  | ssb-Index-SINR-r16 |
| Number of reported RS | 1~2 |  | 2 |
| L1-SINR reporting period | 1~2 | slot | 640 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 2 |
| Propagation condition | 1~2 |  | AWGN |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~2 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 7.6.6.2.4-3: Test Environment parameters for FR2 SSB based CMR and CSI-IM based 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 7.6.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.6.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.6.2.4.1-2. 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 NR SA, 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 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.6.2.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 640 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.6.2.5-1. T2 starts.

5. The UE shall start sending valid L1-SINR reports. The SS shall check the following requirements:

- R1: the UE shall start to transmit valid L1-SINR reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirements for SSB#1 Table 7.6.6.2.5-2 for all test configurations. If the first valid report is received before 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 L1-SINR reports every 640 slots. 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 corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations, 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 corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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.

7.6.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.6.2.4.3-1: Common Exception messages for FR2 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 H.3.4-1 |

Table 7.6.6.2.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.6.6.2.5 Test requirement

Table 7.6.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.2.5-1: SSB specific test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **SSB#0** | | **SSB#1** | |
| **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.9.1 | | | |
| Beam assumptionNote 4 | 1~2 |  | Rough | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
| 2 | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 2 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -64 | -64 | -67 | -57.5 |
| 2 | -64 | -64 | -67 | -57.5 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1

- 1920 for UE supporting power class 2,3 or 4.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations.

Table 7.6.6.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations R1 and R3

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | - | 53 |
| Highest reported value (SSB#1) | - | 72 |

Table 7.6.6.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations R4

|  |  |  |
| --- | --- | --- |
|  | T1 | T2 |
| Lowest DIFF SINR reported (SSB#0) | - | 5 |
| Highest DIFF SINR reported (SSB#0) | - | 12 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

7.6.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting long DRX cycle and L1-SINR measurement.

7.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.3.

7.6.6.3.4 Test description

7.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.3.4.1-1.

Table 7.6.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table 7.6.6.3.4.1-2: General test parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| CSI-RS as CMR configuration | 1 |  | CSI-RS.3.3 TDD |
| CSI-RS as IMR configuration | 1 |  | CSI-RS.3.2A TDD |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| DRX configuration | 1 |  | DRX.3 |
| reportConfigType | 1 |  | aperiodic |
| reportQuantity-r16 | 1 |  | cri-SINR-r16 |
| Number of reported RS | 1 |  | 2 |
| qcl-Info | 1 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1 |  | 26 |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 7.6.6.3.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and CSI-RS based 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 7.6.6.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. Message contents are defined in clause 7.6.6.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.3.4.2 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 PCell. 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 7.6.6.3.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.6.6.3.5-1. T1 starts.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. 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 7.6.6.3.5-2 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 7.6.6.3.5-3 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 *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),  
or:  
- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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.

7.6.6.3.4.3 Message contents

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

Table 7.6.6.3.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and CSI-RS 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 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  Table H.3.4-1 |

Table 7.6.6.3.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| } |  |  |  |
| } |  |  |  |

7.6.6.3.5 Test requirement

Table 7.6.6.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.3.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based CMR and CSI-RS based IMR L1-SINR measurement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.9.1 | |
| Assumption for UE beamsNote 3 | 1~2 |  | Rough | |
| Note1 | 1~2 | dBm/15kHz | -105 | |
| Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
|  | 1~2 | dB | 1.5 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -94.5 | -87.0 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.2 | -57.5 |
|  | 1~2 | dB | 1.5 | 9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 1440ms 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 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 7.6.6.3.5-2 the corresponding relative accuracy requirements in Table 7.6.6.3.5-3.

Table 7.6.6.3.5-2: L1-SINR absolute accuracy requirements for the reported values R2

|  |  |
| --- | --- |
| Normal Conditions | T1 |
| Lowest reported value (CSI-RS#1) | 54 |
| Highest reported value (CSI-RS#1) | 71 |

Table 7.6.6.3.5-3: L1-SINR relative accuracy requirements for the reported values R3

|  |  |
| --- | --- |
|  | T1 |
| Lowest DIFF SINR reported (CSI-RS#0) | 4 |
| Highest DIFF SINR reported (CSI-RS#0) | 10 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 7.6.7 to 7.6.12

### 7.6.13 UE Rx-Tx time difference measurements for PDC

#### 7.6.13.0 Minimum conformance requirements

7.6.13.0.1 PRS based UE Rx-Tx time difference for propagation delay compensation

When UE is configured with *prs-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [2] and provided with PRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period TUERx-Tx\_PRS, where:

Where:

is the maximum number of DL PRS resources configured in a slot,

is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumberPRS-ResourceProcessedPerSlot-r17* as specified in TS38.331 [2],

is the number of UE Rx-Tx time difference measurement samples and = 4,

is the PRS resource periodicity specific for RTT-based propagation delay compensation,

is the DRX cycle length when DRX is in use, 1ms otherwise.

is

Ntotal / Navailable, when Navailable>0

Where,

- For a window W of duration LCM(TPRS, MGRP\_max, TSMTC), where TSMTC is the periodicity of SMTC for intra-frequency measurement without gap, and MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as the PDC PRS for UE supporting *concurrentMeasGap-r17*, or is the MGRP of configured per-UE measurement gap or per-FR measurement gap within the same FR as the PDC PRS for UE not supporting *concurrentMeasGap-r17*,starting at the beginning of any PRS resource occasion:

- Ntotal is the total number of PRS resource occasions within the window W, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Navailable is the number of PRS resource occasions that are not overlapped with:

- For FR2: any measurement gap occasions after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3 nor any SMTC occasions within the window W.

No requirements shall apply if Navailable=0.

UE is only required to perform UE Rx-Tx time difference on PRS within the active DL BWP.

When UE is configured to perform UE Rx-Tx time difference measurement based on PRS, the requirements apply provided that the SCS of the PRS is same as that of the active BWP on PCell.

For FR2, the requirements apply if QCL information is provided for all the PRS resources in the resource set and for each resource one RS has QCL-TypeD.

If PRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the

measurement report mapping requirements specified in clause 10.1.25.3, with k = 5.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

Table 7.6.13.0.1-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| **Reported Quantity Value** | **Measured Quantity Value** | **Unit** |
| RX-TX\_TIME\_DIFFERENCE\_0000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0001 | -985024  TUE Rx-Tx < -984992 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0002 | -984992  TUE Rx-Tx < -984960 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_30782 | -32  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_30783 | 0  TUE Rx-Tx < 32 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_61563 | 984960  TUE Rx-Tx < 984992 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_61564 | 984992  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_61565 | 985024  TUE Rx-Tx | Tc |

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC DL PRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 7.6.13.0.1-2 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex [TBD] for a corresponding Band.

AWGN propagation condition.

Table 7.6.13.0.1-2: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± [22+d+ℇ] | -3 | ≥[24] | 60 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [15+d+ℇ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+d+ℇ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [12+d+ℇ] |  | ≥[32] | 120 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [7+d+ℇ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+d+ℇ] |  | ≥[128] |  | ≥[1] | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeNdefined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.39.2-4.  NOTE 8: ℇ is the margin for reporting quantitization error and ℇ=16 Tc. | | | | | | |

Table 7.6.13.0.1-3: Margin for UE Rx-Tx time difference measurement accuracy in FR2

|  |  |  |
| --- | --- | --- |
| **Min(PRS BW, SRS BW) (MHz)** | | **Margin (Tc Note 1)** |
| **SCS = 60 kHz** | **SCS = 120 kHz** |
| ≥ 24 | N/A | [76] |
| ≥ 64 | ≥ 32 | [32] |
| ≥ 132 | ≥ 64 | [24] |
| N/A | ≥ 128 | [20] |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. | | |

##### 7.6.13.0.2 TRS based UE Rx-Tx time difference for propagation delay compensation

When UE is configured with *csi-RS-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [2] and provided with TRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period TUERx-Tx\_TRS, where:

Where

is the number of UE Rx-Tx time difference measurement samples and is [4],

is the TRS resource periodicity specific for RTT-based propagation delay compensation,

is the DRX cycle length when DRX is in use, 1ms otherwise.

is

Ntotal / Navailable when Navailable>0

Where,

- For a window W of duration LCM(TTRS, MGRP\_max, TSMTC) and starting at the beginning of any TRS resource occasion, where TSMTC is the periodicity of SMTC for intra-frequency measurement without gap and MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as PCell for a UE that support *concurrentMeasGap-r17* and is configured with concurrent measurement gaps, otherwise MGRP\_max is the MGRP of configured per-UE measurement gap or per-FR measurement gap within the same FR as PCell:

- Ntotal is the total number of TRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- Navailable is the number of TRS resource occasions that are not overlapped with

- For FR2: any measurement gap occasions after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3 nor any SMTC occasions within the window W.

No requirements shall apply if Navailable=0.

UE is only required to perform UE Rx-Tx time difference on TRS within the active DL BWP. When UE is configured to perform UE Rx-Tx time difference measurement based on TRS, the requirements apply provided that the SCS of the TRS is same as that of the active BWP on PCell.

For FR2, the requirements apply if QCL information is provided for all the TRS resources in the resource set and for each resource one RS has QCL-TypeD.

If TRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the

measurement report mapping requirements specified in clause TS 38.133 10.1.25.3, with k = 5.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

**Table 7.6.13.0.2-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5**

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_0000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0001 | -985024  TUE Rx-Tx < -984992 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0002 | -984992  TUE Rx-Tx < -984960 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_30782 | -32  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_30783 | 0  TUE Rx-Tx < 32 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_61563 | 984960  TUE Rx-Tx < 984992 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_61564 | 984992  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_61565 | 985024  TUE Rx-Tx | Tc |

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

- NTA\_offset defined in TS 38.133 Table 7.1.2-2 changes during the UE Rx-Tx measurement period or

- if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC TRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in 7.6.13.0.2-2 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to TS 38.133 Annex B.2.13 for a corresponding Band.

AWGN propagation condition.

Table 7.6.13.0.2-2: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | |
| TRS Ês/Iot | Minimum TRS bandwidth | TRS SCS | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | RB | kHz | dBm / SCSTRS | dBm/BWChannel |
| [29+d+ℇ] | -3 | ≥[24] | 60 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [14+d+ℇ] |  | ≥[64] |  | NOTE 5 | NOTE 5 |
| [7+d+ℇ] |  | ≥[132] |  | NOTE 5 | NOTE 5 |
| [15+d+ℇ] |  | ≥[32] | 120 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [7+d+ℇ] |  | ≥[64] |  | NOTE 5 | NOTE 5 |
| [4+d+ℇ] |  | ≥[128] |  | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in TRS slots. The same Io range applies to TRS and non-TRS symbols. Io levels are different in TRS and non-TRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the TRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: d is the margin determined from Table 10.1.39.3-4.  NOTE 7: ℇ is the margin for reporting quantitization error and ℇ=16 Tc. | | | | | |

Table 7.6.13.0.2-3: Margin for UE Rx-Tx time difference measurement accuracy in FR2

|  |  |  |
| --- | --- | --- |
| Min(TRS BW, SRS BW) (MHz) | | Margin (Tc Note 1) |
| SCS = 60 kHz | SCS = 120 kHz |
| ≥ 24 | N/A | [76] |
| ≥ 64 | ≥ 32 | [32] |
| ≥ 132 | ≥ 64 | [24] |
| N/A | ≥ 128 | [20] |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and TRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. | | |

#### 7.6.13.1 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using PRS

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3











7.6.13.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133[6] clause 9.12.4.1 in AWGN propagation condition in FR2 in standalone scenario.

7.6.13.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-PRS-r17 or gNB-SideRTT-BasedPDC-r17.*

7.6.13.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.13.1.0.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.1, 9.12.5, 10.1.39.2 and A.7.6.13.1.

7.6.13.1.4 Test description

7.6.13.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.13.1.4.1-1

Table 7.6.13.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 7.6.13.1-1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 7.6.13.1.4.1-2.

Table 7.6.13.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for SA FR2

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.13.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. The general test parameter settings are set up according to Table 7.6.13.1.4.1-3.

2. Message contents are defined in clause 7.6.13.1.4.3.

3. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

Table 7.6.13.1.4.1-3: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value |
| Active cell |  | 1 | Cell 1 |
| RF Channel Number |  | 1 | 1 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |
| SSB configuration |  | 1 | SSB.2 FR2 |
| SMTC configuration |  | 1 | SMTC.1 |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |
| CP length |  | 1 | Normal |
| DRX |  | 1 | OFF |
| T1 | s | 1 | 5 |
| T2 | s | 1 | 20 |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | |

7.6.13.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. The Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

The *MeasObjectRxTxDiff-r17* is configured with *prs-Ref-r17, measObject* with *measObjectRxTxDiff-r17,* and *NR-DL-PRS-PDC-Info* is defined ~~in~~ as per7.6.13.1.4.3 and shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE ΔT ms before the start of T2, where ΔT = [TBD] ms. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 7.6.13.1.4.1-3 and Table 7.6.13.1.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.6.13.1.5-1 as appropriate.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.13.1.5-1. T2 starts.

6. The UE shall transmit periodically MeasurementReport messages.

7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. The result-k5 value is outside the limits in Table 7.6.13.1.0-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

8. 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.

7.6.13.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-76Bin 38.508-1 [14] withcondition PRS\_REF |
| Specific message contents exceptions for Test Configuration 7.6.13.1-1 | Table 4.6.3-84ACin38.508-1 [14] withcondition SCS120 |

7.6.13.1.5 Test requirements

Table 7.6.13.1.4.1-3 and Table 7.6.13.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR2 SA.

Table 7.6.13.1.5-1: Cell specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
|  |  | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.9.1 | |
| Beam Assumption |  | 1 | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | |
| OCNG Patterns |  | 1 | OP.1 | |
| TRS Configuration |  | 1 | TRS.2.1 TDD | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | |
| PRS configuration |  | 1 | PRS.1.1 FR2 | |
| PRS muting info |  | 1 | ‘10’ | |
| SRS configuration |  | 1 | PDC-SRS.3 | |
| Note 2 | dBm/SCS | 1 | -89 | |
| Note 2 | dBm/15 kHz | 1 | -98 | |
| PRS | dB | 1 | -Infinity | -2.41 |
| PRS | dB | 1 | -Infinity | -2 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.63 |
| Propagation Condition |  | 1 | AWGN | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

Table 7.6.13.1.5-2: SRS Configuration for FR2 Propagation Delay Compensation

|  |  |  |
| --- | --- | --- |
|  | **PDC-SRS.3** |  |
| **Field** |  | **Comment** |
| c-SRS | Same as NRB,c in the test case |  |
| b-SRS | 0 |  |
| b-hop | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 |  |
| pathlossReferenceRS  ssb-Index | 0 | SSB #0 is used for SRS path loss estimation |
| usage | usagePDC-r17 |  |
| startPosition | 5 | resourceMapping setting |
| nrofSymbols | 4 |  |
| repetitionFactor | n1 | without repetition. |
| transmissionComb | n4 |  |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 |  |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic |  |
| periodicityAndOffset-p | Sl1280, 160 | SRS transmission periodicity |

The UE Rx-Tx time difference measurement time shall fulfils the requirements specified in clause 7.6.13.0.1. The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1, for k=5.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 7.6.13.0.1 for Cell 1.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 7.6.13.2 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using TRS

Editor’s note: This test case is incomplete. The following aspects are either missing or TBD:

- Test purpose contains [] and reference clause with X

- Measurement Uncertainties and Test Tolerances are missing

- Annex F

7.6.13.2.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133[6] clause 9.12.4.2 for measurement delay and clause 10.1.X.2 for measurement accuracy in AWGN propagation condition in FR2 in standalone scenario.

7.6.13.2.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-CSI-RS-ForTracking-r17* *or gNB-SideRTT-BasedPDC-r17.*

7.6.13.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.13.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.2, 9.12.5, 10.1.39.3 and A.7.6.13.2.

7.6.13.2.4 Test description

7.6.13.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.13.2.4.1-1

Table 7.6.13.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 7.6.13.2-1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 7.6.13.2.4.1-2.

Table 7.6.13.2.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for SA FR2

|  |  |  |  |
| --- | --- | --- | --- |
| 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.13.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram |  | |  |

1. The general test parameter settings are set up according to Table 7.6.13.2.4.1-3.

2. Message contents are defined in clause 7.6.13.2.4.3.

3. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I

Table 7.6.13.2.4.1-3: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value |
| Active cell |  | 1 | Cell 1 |
| RF Channel Number |  | 1 | 1 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |
| SSB configuration |  | 1 | SSB.2 FR2 |
| SMTC configuration |  | 1 | SMTC.1 |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |
| CP length |  | 1 | Normal |
| DRX |  | 1 | OFF |
| T1 | s | 1 | 5 |
| T2 | s | 1 | 20 |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | |

7.6.13.2.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 does not have TRS transmission during T1 and transmits TRS during T2.

The measurement control information with *MeasObjectRxTxDiff* set to ‘csi-RS-Ref’ as defined in clause 7.6.13.2.4.3 shall be provided to the UE during T1. The last TTI containing the RRC configuration shall be provided to the UE DT ms before the start of T2, where DT = [10] ms is the maximum processing time of the measurement request. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 7.6.13.2.4.1-3 and Table 7.6.13.2.5-1, respectively. The test consists of two sub-tests with different TRS BW.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.6.13.2.5-1 as appropriate.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.13.2.5-1. T2 starts.

6. The UE shall transmit periodically MeasurementReport messages.

7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. The result-k5 value is outside the limits in Table 7.6.13.0.2-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

8. 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.

7.6.13.2.4.3 Message contents

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

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-76Bin 38.508-1 [14] withcondition CSI-RS\_REF |

7.6.13.2.5 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in 7.6.13.0.2

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.39.3.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified [in clause 10.1.25.3.1, for k=5].

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

Table 7.6.13.2.4.1-3 and Table 7.6.13.2.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR2 SA.

Table A.7.6.13.2.5-1: Cell specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
|  |  | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.9.1 | |
| Beam AssumptionNote 7 |  | 1 | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | |
| OCNG Patterns |  | 1 | OP.1 | |
| TRS Configuration |  | 1 | TRS.2.1 TDD | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | |
| SRS configuration |  | 1 | PDC-SRS.3 | |
| Note 2 | dBm/SCS | 1 | -89 + TT | |
| Note 2 | dBm/15 kHz | 1 | -98 + TT | |
| TRS | dB | 1 | -Infinity | -[2.41] + TT |
| TRS | dB | 1 | -Infinity | -[2] + TT |
| TRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -[91] + TT |
| Io | dBm/95.04 MHz | 1 | N/A | -[57.63] + TT |
| Propagation Condition |  | 1 | AWGN | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: TRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: TRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in TS 38.133 B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

**Table 7.6.13.2.5-2: SRS Configuration for FR2 Propagation Delay Compensation**

|  |  |  |
| --- | --- | --- |
|  | **PDC-SRS.3** |  |
| **Field** |  | **Comment** |
| c-SRS | Same as NRB,c in the test case |  |
| b-SRS | 0 |  |
| b-hop | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 |  |
| pathlossReferenceRS  ssb-Index | 0 | SSB #0 is used for SRS path loss estimation |
| usage | usagePDC-r17 |  |
| startPosition | 5 | resourceMapping setting |
| nrofSymbols | 4 |  |
| repetitionFactor | n1 | without repetition. |
| transmissionComb | n4 |  |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 |  |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic |  |
| periodicityAndOffset-p | Sl1280, 160 | SRS transmission periodicity |

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.7 Measurement performance requirements

### 7.7.1 SS-RSRP

#### 7.7.1.0 Minimum conformance requirements

##### 7.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.1.

##### 7.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.2.

#### 7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.1.

7.7.1.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the NR FR2 neighbour cell.

7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.1.4.1-1.

Table 7.7.1.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.7.1.1-1 | NR 120 kHz SSB SCS, 100 MHz 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 7.7.1.1.4.1-2.

Table 7.7.1.1.4.1-2: Initial conditions

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. The general test parameter settings are set up according to Table 7.7.1.1.4.1-3.

2. Message contents are defined in clause 7.7.1.1.4.3.

3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRP measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete 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 for the following requirements:

- R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, 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 SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 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 for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R10. Otherwise, R10 is passed.

8. Set the parameters according to Test 2 in Table 7.7.1.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

- R7: The SS-RSRP value of Cell 1 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 1 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

- R8: The SS-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

8a. The SS shall check all the SS-RSRP reported values during Test 2 for the following requirements:

- R11: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R11. Otherwise, R11 is passed.

- R12: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R12. Otherwise, R12 is passed.

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 7.7.1.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

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 7.7.1.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition Synchronous cells  Table H.3.1-5  Table H.3.1-7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.1.1.5 Test requirement

Table 7.7.1.1.5-1 defines the cell specific settings for all tests. Table 7.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.1.1 and relative accuracy requirements in clause 7.7.1.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-4.

R9: ∆(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

R10: ∆(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-4.

R11: ∆(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

R12: ∆(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

During T1 and T2:

R7: Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-5.

R8: Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-5.

Table 7.7.1.1.5-1: SS-RSRP Intra frequency general test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ParameterNote 5 | Unit | T1 | | T2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Physical cell ID |  | 489 | 0 | 489 | 0 |
| SSB ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 24 | | 24 | |
|  |  |  |  |  |  |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.2 TDD | - | SR.3.2 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| 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\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 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: Void  Note 3: Void  Note 4: Void  Note 5: All parameters apply for configuration 1 and 2  Note 6: Void | | | | | |

Table 7.7.1.1.5-2: SS-RSRP Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | T1 | | T2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 | | | |
| Assumption for UE beamsNote 8 |  | Rough | | | |
| Note1 | dBm/15kHzNote4 | -97.4 | | N/A | |
| Note1 | dBm/SCSNote4 | -88.37 | | N/A | |
|  | dB | 6.0 | 1.4 | N/A | N/A |
| Es | dBm/SCSNote4 |  |  | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| SSB\_RPNote2 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| BB Note6 | dB | 2.20 | -5.59 | -1.77 | -1.77 |
| IoNote2 | dBm/95.04 MHz Note4 | -55.74 | | (Table B.2.2-2 Rx Beam Peak +37.40dB) | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [3] Table 6.2.1.3-4.  Note 7: All parameters apply for configurations 1 and 2  Note 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | |

Table 7.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

|  |  |  |  |
| --- | --- | --- | --- |
| UE power class 3 | | | |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 1) | 50 | n257, n258, n261 | 31 |
| n260 | 33 |
| n259 | FFS |
| Highest reported value (Cell 1) | 108 | n257, n258, n261 | 88 |
| n260 | 90 |
| n259 | FFS |
| Lowest reported value (Cell 2) | 46 | n257, n258, n261 | 31 |
| n260 | 33 |
| n259 | FFS |
| Highest reported value (Cell 2) | 103 | n257, n258, n261 | 88 |
| n260 | 90 |
| n259 | FFS |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (Cell 1) | 47+ FFS | n257, n258, n261 | 28 + FFS |
| n260 | 30 + FFS |
| n259 | FFS |
| Highest reported value (Cell 1) | 111+ FFS | n257, n258, n261 | 91 + FFS |
| n260 | 93 + FFS |
| n259 | FFS |
| Lowest reported value (Cell 2) | 46+ FFS | n257, n258, n261 | 28+ FFS |
| n260 | 30+ FFS |
| n259 | FFS |
| Highest reported value (Cell 2) | 106+ FFS | n257, n258, n261 | 91+ FFS |
| n260 | 93+ FFS |
| n259 | FFS |

Table 7.7.1.1.5-3a: evaluation limits for the ∆(Max-Min) reported values for each cell during each time period

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value Cell 1 | 16 | 16 |
| ∆(Max-Min) reported value Cell 2 | 16 | 16 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value Cell 1 | 16 + FFS | 16+ FFS |
| ∆(Max-Min) reported value Cell 2 | 16 + FFS | 16 + FFS |

Table 7.7.1.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| Lowest reported value (Cell 2 – Cell 1) | - 12 | - 6 |
| Highest reported value (Cell 2 – Cell 1) | + 2 | + 6 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| Lowest reported value (Cell 2 – Cell 1) | - 15+ FFS | - 9+ FFS |
| Highest reported value (Cell 2 – Cell 1) | + 5+ FFS | + 9+ FFS |

Table 7.7.1.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8

|  |  |  |  |
| --- | --- | --- | --- |
| UE power class 3 | | | |
| Test 2 | Bands | Normal Conditions | Extreme Conditions |
| Lowest reported value (Cell 1 T2 – Cell 1 T1) | n257, n258, n261 | - 28 | - 31+ FFS |
| n260 | - 26 | - 29+ FFS |
| n259 | FFS | FFS |
| Highest reported value (Cell 1 T2 – Cell 2 T1) | n257, n258, n261 | - 12 | - 9+ FFS |
| n260 | - 10 | - 7+ FFS |
| n259 | FFS | FFS |
| Lowest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | - 24 | - 27+ FFS |
| n260 | - 21 | - 24+ FFS |
| n259 | FFS | FFS |
| Highest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | - 8 | - 5+ FFS |
| n260 | - 5 | - 2+ FFS |
| n259 | FFS | FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

#### 7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.2.

7.7.1.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.2.4.1-1.

Table 7.7.1.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.7.1.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| 7.7.1.2-2 | NR 240 kHz SSB SCS, 100 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 7.7.1.2.4.1-2.

Table 7.7.1.2.4.1-2: Initial conditions

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. The general test parameter settings are set up according to Table 7.7.1.2.4.1-3.

2. Message contents are defined in clause 7.7.1.2.4.3.

3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRP measurements.

4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.7.1.2.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.4. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete 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 for the following requirements:

- R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed samples for R1 is increased by one. Otherwise, the number of passed samples for R1 is increased by one.

- R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R2 is increased by one. Otherwise, the number of passed samples for R2 is increased by one.

- R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed samples for R3 is increased by one. Otherwise, the number of passed samples for R3 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 for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R7: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R7. Otherwise, R7 is passed.

- R8: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R8. Otherwise, R8 is passed.

8. The SS shall select a new test point as defined in A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed samples for R4 is increased by one. Otherwise, the number of passed samples for R4 is increased by one.

- R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R5 is increased by one. Otherwise, the number of passed samples for R5 is increased by one.

- R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.2.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed samples for R6 is increased by one. Otherwise, the number of passed samples for R6 is increased by one.

10. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R10. Otherwise, R10 is passed.

7.7.1.2.4.3 Message contents

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

Table 7.7.1.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-5  Table H.3.1-6 with condition Pattern #0  Table H.3.1-7 with condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.1.2.5 Test requirement

Table 7.7.1.2.5-1 defines the cell specific settings for all tests. Table 7.7.1.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.2.1 and relative accuracy requirements in clause 7.7.1.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.2.5-5.

R7: ∆(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

R8: ∆(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.2.5-5.

R9: ∆(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

R10: ∆(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

Table 7.7.1.2.5-1: SS-RSRP Inter frequency general test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
|  |  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~2 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1~2 |  | 100:  NRB,c = 66 | | 100:  NRB,c = 66 | |
| Data RBs allocated | 1 |  | 24 | | 24 | |
| 2 | 48 | | 48 | |
| Gap pattern ID |  |  | 0 | | 0 | |
| Duplex mode | 1~2 |  | TDD | | TDD | |
| TDD configuration | 1~2 |  | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.3. 2 TDD | - | SR.3. 2 TDD | - |
| 2 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| 2 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| 2 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.3 FR2 | | SSB.3 FR2 | |
|  | 2 |  | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~2 |  | OP.3 | | OP.3 | |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~2 |  | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 1 | 1~2 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |  |
| Propagation condition | 1~2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~2 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void. | | | | | | |

Table 7.7.1.2.5-2: SS-RSRP Inter frequency OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
|  |  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | 1~2 |  | Setup 4b according to clause A.9.4 | | Setup 4b according to clause A.9.4 | |
|  |  |  | AoA1  Spherical coverage | AoA2  Rx Beam Peak | AoA1  Spherical coverage | AoA2  Rx Beam Peak |
| Assumption for UE beamsNote 7 | 1~2 |  | Rough | | Rough | |
| Note1 | 1, | dBm/15kHzNote4 | -96.3 | -96.3 | (Table B.2.3-2 Rx Beam PeakNote 8 -4.63dB) | (Table B.2.3-2 Rx Beam PeakNote 8 -3.03dB) |
|  | 2 |  | -99.3 | -99.3 |
| Note1 | 1 | dBm/SCSNote4 | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam PeakNote 8 +4.4dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +6.0dB) |
|  | 2 |  | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam PeakNote 8 +7.4dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +9.0dB) |
|  | 1~2 | dB | 6.0 | 6.0 | 17.0 | 1.0 |
| SSB\_RPNote2 | 1 | dBm/SCS | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam PeakNote 8 +21.4dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +7.0dB) |
|  | 2 |  | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam PeakNote 8 +24.4dB) | (Table B.2. 3-2 Rx Beam PeakNote 8 +10.0dB) |
| (SSB\_RPCell 1 – SSB\_RPCell 2) | 1~2 | dB | 0 | | 14.40 | |
| BBNote6 | 1 | dB | 5.23 | 5.93 | 5.38 | -1.46 |
| 2 | 4. 58 | 5.87 |
| IoNote2 | 1 | dBm/95.04 MHz Note4 | -55.70 | -55.70 | (Table B.2.3-2 Rx Beam PeakNote 8 +46.08dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +35.13dB) |
|  | 2 |  | -55.7 | -55.7 | (Table B.2.3-2 Rx Beam PeakNote 8 +49.09dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +38.14dB) |
| (Iofreq 1 – Io freq 2) | 1~2 | dB | 0 | | 11.95 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot, Io, (SSB\_RPCell 2 – SSB\_RPCell 1) and (Iofreq 2 – Io freq 1) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP or ΔMBS from TS 38.101-2 [3] Table 6.2.1.3-4.  Note 7: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation  Note 8: The value in Table B.2.3-2 of TS 38.133 [6] is the Minimum SSB\_RP for SCSSSB = 120 kHz, selected according to the operating band of Cell 2 and UE power class, without ∆MBP,n adjustment. | | | | | | |

Table 7.7.1.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE power class 3 | | | | |
| Normal Conditions | Test 1 | | Test 2 | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 | n257, n258, n261 | 33 |
| n260 | 39 | n260 | 34 |
| n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 | | n257, n258, n261 | 101 |
| n260 | 104 |
| n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 | | n257, n258, n261 | 32 |
| n260 | 34 |
| n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 87 |
| n260 | 90 |
| n259 | FFS |
| Extreme Conditions | Test 1 | | Test 2 | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 33 + FFS |
| n260 | 39 + FFS | n260 | 34 + FFS |
| n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 + FFS | | n257, n258, n261 | 101 + FFS |
| n260 | 104 + FFS |
| n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 + FFS | | n257, n258, n261 | 32+ FFS |
| n260 | 34+ FFS |
| n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 87+ FFS |
| n260 | 90+ FFS |
| n259 | FFS |

Table 7.7.1.2.5-3a: evaluation limits for the ∆(Max-Min) reported absolute values for cell 2 during each time period

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value Cell 2 | 16 | 16 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value Cell 2 | 16 + FFS | 16 + FFS |

Table 7.7.1.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE power class 3 | | | | |
| Normal Conditions | Test 1 | | Test 2 | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 | n257, n258, n261 | 36 |
| n260 | 39 | n260 | 37 |
| n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 | | n257, n258, n261 | 104 |
| n260 | 107 |
| n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 | | n257, n258, n261 | 35 |
| n260 | 37 |
| n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 90 |
| n260 | 93 |
| n259 | FFS |
| Extreme Conditions | Test 1 | | Test 2 | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 36 + FFS |
| n260 | 39 + FFS | n260 | 37 + FFS |
| n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 + FFS | | n257, n258, n261 | 104 + FFS |
| n260 | 107 + FFS |
| n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 + FFS | | n257, n258, n261 | 35+ FFS |
| n260 | 37+ FFS |
| n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 90+ FFS |
| n260 | 93+ FFS |
| n259 | FFS |

Table 7.7.1.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE power class 3 | | | | |
| Normal Conditions | Test 1 | | Test 2  All bands | |
| Lowest value (RSRP report Cell 2 – RSRP report Cell 1) | All bands: -15 | | -29 | |
| Highest value (RSRP report Cell 2 – RSRP report Cell 1) | n257, n258, n261 | +25 | n257, n258, n261 | +11 |
| n260 | +27 | n260 | +13 |
| n259 | FFS | n259 | FFS |
| Extreme Conditions | Test 1 | | Test 2  All bands | |
| Lowest value (RSRP report Cell 2 – RSRP report Cell 1) | -15 + FFS | | -29+ FFS | |
| Highest value (RSRP report Cell 2 – RSRP report Cell 1) | n257, n258, n261 | +25 + FFS | n257, n258, n261 | +11 + FFS |
| n260 | +27+ FFS | n260 | +13 + FFS |
| n259 | FFS | n259 | FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

#### 7.7.1.3 Inter-frequency measurements between FR1 and FR2

##### 7.7.1.3.1 NR SA FR1-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

- NR FR1 - FR2 OTA testability is still FFS.

7.7.1.3.1.1 Test Purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy with FR1 serving cell and FR2 target cell.

7.7.1.3.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.7.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.3.

7.7.1.3.1.4 Test description

7.7.1.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.3.1.4.1-1.

Table 7.7.1.3.1.4.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

|  |  |  |
| --- | --- | --- |
| Config | Description of serving cell | Description of target cell |
| 7.7.1.3.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.7.1.3.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 7.7.1.3.1-3 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.3.1.4.1-2.

Table 7.7.1.3.1.4.1-2: Initial conditions for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| 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.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.1.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.7.1.3.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR FR2 neighbour cell (the target cell for SS-RSRP measurements) on a different frequency than the PCell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

3. The directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.7.1.3.1.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.2. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, 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 7.7.1.3.5-1 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 for the following requirements:

- R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 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 for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. The SS shall select a new test point as defined in A.9.2 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.1.3.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

7.7.1.3.1.4.3 Message contents

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

Table 7.7.1.3.1.4.3-1: Common Exception messages for NR SA FR1-FR2 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.3.1-3 with Condition SSB.1 FR1 and Synchronous cells  Table H.3.1-5  Table H.3.1-6 with condition Pattern #0  Table H.3.1-7 with Condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.1.3.1.4.3-2: ReportConfigNR-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 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 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.1.3.1.5 Test requirement

Table 7.7.1.3.1.5-1 and Table 7.7.1.3.1.5-2 define the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 7.7.1.3.1.5-1 and 7.7.1.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.1.3.1.5-3.

Table 7.7.1.3.1.5-1: SS-RSRP inter-frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~3 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1 | MHz | 10:  NRB,c = 52 | 100:  NRB,c = 66 | 10:  NRB,c = 52 | 100:  NRB,c = 66 |
| 2 | 10:  NRB,c = 52 | 10:  NRB,c = 52 |
| 3 | 40:  NRB,c = 106 | 40:  NRB,c = 106 |
| Duplex mode | 1 |  | FDD | TDD | FDD | TDD |
| 2 | TDD | TDD |
| 3 | TDD | TDD |
| TDD configuration | 1 |  | N/A | TDDConf.3.1 | N/A | TDDConf.3.1 |
| 2 | TDDConf.1.1 | TDDConf.1.1 |
| 3 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD | SR.1.1 TDD |
| 3 | SR.2.1 FDD | SR.2.1 FDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 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 | - |
| SSB configuration | 1 |  | SSB.1 FR1 | SSB.1 FR2 | SSB.1 FR1 | SSB.1 FR2 |
| 2 | SSB.1 FR1 | SSB.1 FR1 |
| 3 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | 1~3 |  | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~3 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~3 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~3 |  | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 1 and Cell 2 | 1~3 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 | - | NA  Link only, see TS 38.133 [6] clause A.3.7A | AWGN | NA  Link only, see TS 38.133 [6] clause A.3.7A | AWGN |
| Antenna configuration | 1~3 | - | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | | | |

Table 7.7.1.3.5-2: SS-RSRP inter-frequency OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration according to clause A.9 |  |  | NA | Setup 2b | NA | Setup 2b |
| Assumption for UE beamsNote 4 |  |  | N/A | Rough | N/A | Rough |
|  | 1~6 | dBm/15kHz | NA  Link only, see clause A.3.7A of TS 38.133 [6] | -95.5 | NA  Link only, see clause A.3.7A of TS 38.133 [6] | NA |
|  | 1~6 | dBm/SSB SCS | -86.47 | NA |
|  |  |  |
|  | 1~6 | dB | 5 | NA |
| Es | 1~6 | dBm/SCS | NA | (Table B.2.3-2 Spherical coverage +6.5dB) |
| SSB\_RPNote1 | 1~6 | dBm/SCS | -81.47 | (Table B.2.3-2 Spherical coverage +6.5dB) |
|  |  |  |
| BBNote6 | 1~6 | dB | 4.35 | 1.69 |
| IoNote1 | 1~6 | dBm/  95.04MHz | -55.68 | SSB\_RP+34.48 |
| Note 1: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, of TS 38.133 [6] and does not limit UE implementation or test system implementation.  Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [2], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [2] Table 6.2.1.3-4. | | | | | | |

Table 7.7.1.3.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE power class 3 | | | | |
| Normal Conditions | Test 1 | | Test 2 | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 46 | n257, n258, n261 | 46 |
| n260 | 45 | n260 | 47 |
| n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | 103 | n257, n258, n261 | 101 |
| n260 | 102 | n260 | 104 |
| n259 | FFS | n259 | FFS |
| Extreme Conditions | Test 1 | | Test 2 | |
| Lowest reported value (Cell 2) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| n260 | FFS | n260 | FFS |
| n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| n260 | FFS | n260 | FFS |
| n259 | FFS | n259 | FFS |

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%.

##### 7.7.1.3.2 Void

### 7.7.2 SS-RSRQ

#### 7.7.2.0 Minimum conformance requirements

##### 7.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.1.

##### 7.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.2.

#### 7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.2.1.1 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.

7.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.1.

7.7.2.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

7.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.1.4.1-1.

Table 7.7.2.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.7.2.1-1 | NR 120 kHz SSB SCS, 100 MHz 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 7.7.2.1.4.1-2.

Table 7.7.2.1.4.1-2: Initial conditions

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. The general test parameter settings are set up according to Table 7.7.2.1.4.1-3.

2. Message contents are defined in clause 7.7.2.1.4.3.

3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRQ measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete 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 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for 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 7.7.2.1.5-2 as appropriate and repeat steps 5-7.

7.7.2.1.4.3 Message contents

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

Table 7.7.2.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition Synchronous cells  Table H.3.1-5  Table H.3.1-7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.2.1.5 Test requirement

Table 7.7.2.1.5-1 defines the cell specific settings for all tests. Table 7.7.2.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 7.7.2.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.2.1.5-3.

Table 7.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | Test 2 | |
|  | |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | |  | Freq1 | | Freq1 | |
| Duplex mode | |  | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| 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 | | | |
| TRS configuration | |  | TRS.2.1 TDD |  | TRS.2.1 TDD |  |
| TCI state | |  | TCI.State.0 |  | TCI.State.0 |  |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD |  | SR.3.1 TDD |  |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | - | CR.3.1 TDD |  |
| Control channel RMC | |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | |  | SMTC.1 | | | |
| SSB configuration | |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | |  | Not Applicable | | | |
| 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\_DMRS | |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |  |  |  |
| Propagation condition | |  | 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: Void  Note 3: Void  Note 4: Void  Note 5: Void. | | | | | | |

Table 7.7.2.1.5-2: SS-RSRQ Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 | | Setup 1 | |
| Assumption for UE beamsNote 9 |  | Rough | | | |
| Note1 | dBm/15kHzNote4 | -100.7 | | -96.7 | |
| Note1 | dBm/SCSNote3 | -91.67 | | -87.67 | |
| SSB\_RPNote2 | dBm/SCS Note4 | -88.67 | -88.67 | -90.67 | -90.67 |
| SS-RSRQ Note2 | dB | -14.81 | -14.81 | -16.84 | -16.84 |
|  | dB | -1.76 | -1.76 | -4.76 | -4.76 |
|  | dB | 3 | 3 | -3 | -3 |
| IoNote2 | dBm/95.04 MHz Note4 | -55.7 | | -55.67 | -55.67 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRQ, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void.  Note 7: Void  Note 8: Void  Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | |

Table 7.7.2.1.5-3: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
| UE Power Class 3 | Test 1 (All bands) | Test 2 | |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ\_41 | n257, n258, n261 | SS-RSRQ\_35 |
| n260 | SS-RSRQ\_34 |
| n259 | FFS |
| Highest reported value (Cell 2) | SS-RSRQ\_73 | All bands | SS-RSRQ\_71 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ\_38+ FFS | n257, n258, n261 | SS-RSRQ\_34+ FFS |
| n260 | SS-RSRQ\_33+ FFS |
| n259 | FFS |
| Highest reported value (Cell 2) | SS-RSRQ\_76+ FFS | All bands | SS-RSRQ\_72+ FFS |

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%.

#### 7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.2.

7.7.2.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.2.4.1-1.

Table 7.7.2.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.7.2.2-1 | NR 120 kHz SSB SCS, 100 MHz 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 7.7.2.2.4.1-2.

Table 7.7.2.2.4.1-2: Initial conditions

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. The general test parameter settings are set up according to Table 7.7.2.2.4.1-3.

2. Message contents are defined in clause 7.7.2.2.4.3.

3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRQ measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete 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 for the following requirements:

- R1: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, 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 SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 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 7.7.2.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

7.7.2.2.4.3 Message contents

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

Table 7.7.2.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-5  Table H.3.1-6 with condition Pattern #0  Table H.3.1-7 with condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.2.2.5 Test requirement

Table 7.7.2.2.5-1 defines the cell specific settings for all tests. Table 7.7.2.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRQ measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.2.0.2.1 and relative accuracy requirements in clause 7.7.2.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

Table 7.7.2.2.5-1: SS-RSRQ Inter frequency general test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN |  | Freq1 | freq2 | freq1 | Freq2 |
| SSB Configuration |  | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 66 | | 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| 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\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 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: Void  Note 3: Void  Note 4: Void | | | | | |

Table 7.7.2.2.5-2: SS-RSRQ Inter frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup |  | Setup 1 | | Setup 1 | |
| Assumption for UE beamsNote 8 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -95.93 | -95.93 | -95.44 | -95.44 |
| Note1 | dBm/SCSNote3 | -86.9 | -86.9 | -86.41 | -86.41 |
|  | dB | -1.75 | -1.75 | -3 | -3 |
| SSB\_RPNote2 | dBm/SCS Note4 | -88.65 | -88.65 | -89.41 | -89.41 |
| SS-RSRQNote2 | dB | -14.75 | -14.75 | -15.56 | -15.56 |
|  | dB | -1.75 | -1.75 | -3 | -3 |
| IoNote2 | dBm/95.04 MHz Note4 | -55.7 | -55.7 | -55.7 | -55.7 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRQ, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | |

Table 7.7.2.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| Lowest reported value (Cell 1) | RSRQ\_41 | RSRQ\_37 |
| Highest reported value (Cell 1) | RSRQ\_73 | RSRQ\_74 |
| Lowest reported value (Cell 2) | RSRQ\_41 | RSRQ\_37 |
| Highest reported value (Cell 2) | RSRQ\_73 | RSRQ\_74 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| Lowest reported value (Cell 1) | RSRQ\_41 + FFS | RSRQ\_37 + FFS |
| Highest reported value (Cell 1) | RSRQ\_73 + FFS | RSRQ\_74 + FFS |
| Lowest reported value (Cell 2) | RSRQ\_41 + FFS | RSRQ\_37 + FFS |
| Highest reported value (Cell 2) | RSRQ\_73 + FFS | RSRQ\_74 + FFS |

Table 7.7.2.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | - 7 | - 9 |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | + 7 | + 9 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | – 7 + FFS | – 9 + FFS |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | + 7 + FFS | + 9 + FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

### 7.7.3 SS-SINR

#### 7.7.3.0 Minimum conformance requirements

##### 7.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.1.

##### 7.7.3.0.2 Inter-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.2.

#### 7.7.3.1 NR SA FR2 SS-SINR measurement accuracy

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.3.1.1 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.

7.7.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.1.

7.7.3.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.1.4.1-1.

Table 7.7.3.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.7.3.1-1 | NR 120 kHz SSB SCS, 100 MHz 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 7.7.3.1.4.1-2.

Table 7.7.3.1.4.1-2: Initial conditions

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. The general test parameter settings are set up according to Table 7.7.3.1.4.1-3.

2. Message contents are defined in clause 7.7.3.1.4.3.

3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-SINR measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.3.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete 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 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 7.7.3.1.5-2 or the UE fails to report the measurement value for 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 7.7.3.1.5-1 as appropriate and repeat steps 5-7.

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 7.7.3.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition Synchronous cells  Table H.3.1-5  Table H.3.1-7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.3.1.5 Test requirement

Table 7.7.3.1.5-1 defines the cell specific settings for all tests. Table 7.7.3.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 7.7.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.3.1.5-3.

Table 7.7.3.1.5-1: SS-SINR Intra frequency test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN |  | Freq2 | | Freq2 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| 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 |  | TRS.2.1 TDD | | | |
| TCI state |  | TCI.State.0 | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD |  | SR.3.1 TDD |  |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated RMSI CORESET Reference Channel |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 | | | |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement |  | Not Applicable | | | |
| 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\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition |  | 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: Void.  Note 3: Void  Note 4: Void | | | | | |

Table 7.7.3.1.5-2: SS-SINR Intra frequency OTA related test parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | Test 2 | | | |
| Cell 1 | Cell 2 | Cell 1 | | | Cell 2 |
| Angle of arrival configuration | |  | Setup 1 | | Setup 1 | | | |
| Assumption for UE beamsNote 9 | |  | Rough | | Rough | | | |
| Note1 | | dBm/15kHz Note4 | -105 | | -105 | | | |
| Note1 | | dBm/SCS Note3 | -96 | | -96 | | | |
| SSB\_RPNote2 | | dBm/SCS Note4 | -91.46 | -93.34 | -98.8 | | | -98.8 |
| SS-SINR Note2 | n257, 258, n261 | dB | -0.18 | -3.32 | -4.95 | -4.95 | | |
| n260 | -0.31 | -3.42 | -5.20 | -5.20 | | |
| n259 | -0.39 | -3.48 | -5.48 | -5.48 | | |
|  | n257, 258, n261 | dB | -0.18 | -3.32 | -4.95 | -4.95 | | |
| n260 | -0.31 | -3.42 | -5.20 | -5.20 | | |
| n259 | -0.39 | -3.48 | -5.48 | -5.48 | | |
|  | | dB | 4.54 | 2.66 | -3 | | -3 | |
| IoNote2 | | dBm/95.04 MHz Note4 | -59.43 | | -63.87 | | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-SINR, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void.  Note 7: Void  Note 8: Void  Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | | | | |

Table 7.7.3.1.5-3: SS-SINR Intra frequency absolute accuracy requirements for the reported values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE Power Class 3 | Test 1 | | Test 2 | |
| Normal Conditions | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | SS-SINR\_22 | All bands | SS-SINR\_18 |
| n260 | SS-SINR\_21 |
| n259 | FFS |
| Highest reported value (Cell 2) | All bands | SS-SINR\_58 | n257, n258, n261 | SS-SINR\_55 |
| n260 | SS-SINR\_54 |
| n259 | FFS |
| Extreme Conditions | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | SS-SINR\_21+ FFS | All bands | SS-SINR\_17+ FFS |
| n260 | SS-SINR\_20+ FFS |
| n259 | FFS |
| Highest reported value (Cell 2) | All bands | SS-SINR\_59+ FFS | n257, n258, n261 | SS-SINR\_56+ FFS |
| n260 | SS-SINR\_55+ FFS |
| n259 | FFS |

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%.

#### 7.7.3.2 NR SA FR2-FR2 SS-SINR measurement accuracy

Editor’s Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

7.7.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.2.

7.7.3.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.2.4.1-1.

Table 7.7.3.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 7.7.3.2-1 | NR 120 kHz SSB SCS, 100 MHz 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 7.7.3.2.4.1-2.

Table 7.7.3.2.4.1-2: Initial conditions

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. The general test parameter settings are set up according to Table 7.7.3.2.4.1-3.

2. Message contents are defined in clause 7.7.3.2.4.3.

3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-SINR measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.3.2.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.3.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete 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 for the following requirements:

- R1: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, 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 SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 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 7.7.3.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements for Test 2:

- R4: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

And the following requirements for Test 3:

- R7: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one.

- R8: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one.

- R9: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R9 is increased by one. Otherwise, the number of passed iterations for R9 is increased by one.

7.7.3.2.4.3 Message contents

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

Table 7.7.3.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED  Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells  Table H.3.1-5  Table H.3.1-6 with condition Pattern #0  Table H.3.1-7 with condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.3.2.5 Test requirement

Table 7.7.3.2.5-1 defines the cell specific settings for all tests. Table 7.7.3.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-SINR measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.3.0.2.1 and relative accuracy requirements in clause 7.7.3.0.2.2. The following eight requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 3:

R7: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R8: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R9: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

Table 7.7.3.2.5-1: SS-SINR Inter frequency general test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN |  | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode |  | TDD | | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 66 | | 66 | | 66 | |
| 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 |  | TRS.2.1 TDD | | | | | |
| TCI state |  | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| 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\_DMRS |  |  |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | 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: Void  Note 3: Void  Note 4: Void | | | | | | | |

Table 7.7.3.2.5-2: SS-SINR Inter frequency OTA related test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | degrees | Setup 1 | | Setup 1 | | Setup 1 | |
| Assumption for UE beamsNote 10 |  | Rough | | Rough | | Rough | |
| Note1 | dBm/15kHz Note4 | -105 | -105 | -105.1 | -105.1 | -105 | -105 |
| Note1 | dBm/SCS Note3 | -96 | -96 | -96.1 | -96.1 | -96 | -96 |
|  | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| SS-RSRPNote2 | dBm/SCS Note4 | -96.5 | -96.5 | -85.1 | -85.1 | -98.1 | -98.1 |
| SS-SINRNote2 | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
|  | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| IoNote2 | dBm/95.04 MHz Note4 | -69.3 | -69.3 | -55.75 | -55.75 | -64.9 | -64.9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-SINR, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Void  Note 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | | | |

Table 7.7.3.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| UE power class 3 | | | | | | |
| Normal Conditions | Test 1  All bands | | Test 2  All bands | | Test 3  All bands | |
| Lowest reported value (Cell 1) | SINR\_27 | | SINR\_48 | | n257, n258, n261 | SINR\_23 |
| n260 | SINR\_22 |
| n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | SINR\_62 | n257, n258, n261 | SINR\_87 | n257, n258, n261 | SINR\_60 |
| n260 | SINR\_61 | n260 | SINR\_86 | n260 | SINR\_59 |
| n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 2) | SINR\_27 | | SINR\_48 | | n257, n258, n261 | SINR\_23 |
| n260 | SINR\_22 |
| n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR\_62 | n257, n258, n261 | SINR\_87 | n257, n258, n261 | SINR\_60 |
| n260 | SINR\_61 | n260 | SINR\_86 | n260 | SINR\_59 |
| n259 | FFS | n259 | FFS | n259 | FFS |
| Extreme Conditions | Test 1  All bands | | Test 2  All bands | | Test 3  All bands | |
| Lowest reported value (Cell 1) | SINR\_27 + FFS | | SINR\_48 + FFS | | n257, n258, n261 | SINR\_23 + FFS |
| n260 | SINR\_22 + FfS |
| n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | SINR\_62 + FFS | n257, n258, n261 | SINR\_87 + FFS | n257, n258, n261 | SINR\_60 + FFS |
| n260 | SINR\_61 + FFS | n260 | SINR\_86 + FFS | n260 | SINR\_59 + FFS |
| n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 2) | SINR\_27 + FFS | | SINR\_48 + FFS | | n257, n258, n261 | SINR\_23 + FFS |
| n260 | SINR\_22 + FfS |
| n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR\_62 + FFS | n257, n258, n261 | SINR\_87 + FFS | n257, n258, n261 | SINR\_60 + FFS |
| n260 | SINR\_61 + FFS | n260 | SINR\_86 + FFS | n260 | SINR\_59 + FFS |
| n259 | FFS | n259 | FFS | n259 | FFS |

Table 7.7.3.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

|  |  |  |  |
| --- | --- | --- | --- |
| UE power class 3 | | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands | Test 3  All bands |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | - 8 | - 17 | - 9 |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | + 8 | + 17 | + 9 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands | Test 3  All bands |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | – 8 + FFS | – 17 + FFS | – 9 + FFS |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | + 8 + FFS | + 17 + FFS | + 9 + FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

### 7.7.4 L1-RSRP

#### 7.7.4.0 Minimum conformance requirements

##### 7.7.4.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.1.

##### 7.7.4.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.2.

##### 7.7.4.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.3.

##### 7.7.4.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.4.

#### 7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.4.1.1 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.

7.7.4.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.1 and 7.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

7.7.4.1.4 Test description

7.7.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.1.4.1-1.

Table 7.7.4.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.7.4.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.7.4.1-2 | NR 240 kHz SSB SCS, 100 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 7.7.4.1.4.1-2.

Table 7.7.4.1.4.1-2: 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.7.4.1.4.3.

2. Cell 1 is the NR FR2 cell 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 Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.4.1.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and the relative L1-RSRP requirement for SSB#1. The SS shall check following requirements:

- R1: The L1-RSRP value of SSB#0 reported by the UE is compared to the expected L1-RSRP value for SSB#0. If the value is outside the limits in Table 7.7.4.1.5-3, Table 5.7.4.1.5-3a or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The DIFF-RSRP value of SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 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 T2 Table 7.7.4.1.5-1 and repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports for the following requirements.

- R3: The L1-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.1.5-3, Table 5.7.4.1.5-3b or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 or 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 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.7.4.1.4.3 Message contents

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

Table 7.7.4.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with conditions SSB and PERIODIC  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.4.1.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.4.1.5 Test requirement

Table 7.7.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.1.5-3 for test configurations 3 and 6 and Table 7.7.4.1.5-3a for all configurations.

Table 7.7.4.1.5-1: L1-RSRP test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | 1,2 |  | freq1 | freq1 |
| Duplex mode | 1,2 |  | TDD | TDD |
| TDD Configuration | 1,2 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1,2 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Data RBs allocated | 1,2 |  | 66 | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | SR.3.2 TDD |
|  | 2 |  | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
|  | 2 |  | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
|  | 2 |  | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 | SSB.1 FR2 |
| 2 | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1,2 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1,2 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 |  | DLBWP.1.3  ULBWP.1.3 | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1,2 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1,2 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1,2 |  | SMTC.1 | SMTC.1 |
| reportConfigType | 1,2 |  | periodic | periodic |
| reportQuantity | 1,2 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1,2 |  | 2 | 2 |
| L1-RSRP reporting period | 1,2 |  | slot320 | slot320 |
| Propagation condition | 1,2 |  | AWGN | AWGN |
| Antenna configuration |  |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

Table 7.7.4.1.5-2: L1-RSRP OTA related test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | | Unit | Test 1 | | Test 2 NOTE 3 | |
| SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration |  | |  | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beamsNote 4 | |  |  | Rough | | Rough | |
|  | 1,2 | | dBm/15kHz | -104.1 | | n.a. | |
|  | 1 | | dBm/SSB SCS | -95.1 | | n.a. | |
| 2 | | -92.1 | | n.a. | |
|  | 1,2 | | dB | 10 | -1.6 | n.a. | |
| SSB\_RPNote1 | 1 | | dBm/SCS | -85.1 | -96.9 | As in Table B.2.4-2 + 5.7 | |
| 2 | | -78 | -90 | As in Table B.2.4-2 + 5.7 | |
| IoNote1 | 1,2 | | dBm/  95.04MHz | -55.67 | | SSB\_RP+34.68 | |
|  | 1,2 | | dB | 10 | -1.6 | n.a. | |
| Note 1: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

Table 7.7.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1, R3

|  |  |  |  |
| --- | --- | --- | --- |
| UE power class 3 | | | |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (SSB#0) | 42 | n257, n258, n261 | 27 |
| n260 | 30 |
| n259 | FFS |
| Highest reported value (SSB#0) | 101 | n257, n258, n261 | 83 |
| n260 | 86 |
| n259 | FFS |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (SSB#0) | 39 + FFS | n257, n258, n261 | 24 + FFS |
| n260 | 27 + FFS |
| n259 | FFS |
| Highest reported value (SSB#0) | 104 + FFS | n257, n258, n261 | 86 + FFS |
| n260 | 89 + FFS |
| n259 | FFS |

Table 7.7.4.1.5-3a: evaluation limits for the ∆(Max-Min) reported values for SSB#0 for rules R1

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value SSB#0 | 18 | 18 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value SSB#0 | 18 + FFS | 18+ FFS |

Table 7.7.4.1.5-3b: evaluation limits for the ∆(Max-Min) reported values for SSB#0 or SSB#1 for rules R3

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value SSB#0 or SSB#1 | 18 | 18 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value SSB#0 or SSB#1 | 18 + FFS | 18+ FFS |

Table 7.7.4.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 for the absolute accuracy rules R1, R3

|  |  |  |  |
| --- | --- | --- | --- |
| UE power class 3 | | | |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value | 45 | n257, n258, n261 | 30 |
| n260 | 33 |
| n259 | FFS |
| Highest reported value | 104 | n257, n258, n261 | 86 |
| n260 | 89 |
| n259 | FFS |
| n259 | FFS |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value | 42+ FFS | n257, n258, n261 | 27 + FFS |
| n260 | 30 + FFS |
| n259 | FFS |
| Highest reported value | 107+ FFS | n257, n258, n261 | 89 + FFS |
| n260 | 92 + FFS |
| n259 | FFS |

Table 7.7.4.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | 4 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| Lowest DIFF RSRP reported value | 0+ FFS | 0+ FFS |
| Highest DIFF RSRP reported value | 12+ FFS | 7+ FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

#### 7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.4.2.1 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.

7.7.4.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.3 and 7.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

7.7.4.2.4 Test description

7.7.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.2.4.1-1.

Table 7.7.4.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Test Case ID | Description |
| 7.7.4.2-1 | NR 120 kHz SSB SCS, 100 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 7.7.4.2.4.1-2.

Table 7.7.4.2.4.1-2: 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.7.4.2.4.3.

2. Cell 1 is the NR FR2 cell and the target for CSI-RS-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 Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.4.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.4.2.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both CSI-RS0 and CSI-RS1.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

- R1: The L1-RSRP value of CSI-RS0 reported by the UE is compared to the expected L1-RSRP value for CSI-RS0. If the value is outside the limits in Table 7.7.4.2.5-3, Table 5.7.4.2.5-3a or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The DIFF-RSRP value of CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for or CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 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 T2 Table 7.7.4.2.5-1 and repeat steps 3-5. In Step 4, the SS shall check the L1-RSRP reported values of CSI-RS0 and CSI-RS1 in the periodic L1-RSRP reports for the following requirements.

- R3: The L1-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.2.5-3, Table 5.7.4.2.5-3b or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

- R4: The DIFF-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.7.4.2.4.3 Message contents

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

Table 7.7.4.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| **Default Message Contents** | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.6-2 with conditions PERIODIC and CSI-RSRP  Table H.3.6-3 with conditions CSI-RS and PERIODIC  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.4.2.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| csi-RS-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.4.2.5 Test requirement

Table 7.7.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.2.5-3 for test configurations 3 and 6 and Table 7.7.4.2.5-3a for all configurations.

Table 7.7.4.2.5-1: L1-RSRP test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | 1 |  | freq1 | freq1 |
| Duplex mode | 1 |  | TDD | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1 |  | SMTC.1 | SMTC.1 |
| CSI-RS | 1 |  | CSI-RS.3.2 TDD | CSI-RS.3.2 TDD |
| reportConfigType | 1 |  | periodic | periodic |
| reportQuantity | 1 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | 1 |  | 2 | 2 |
| L1-RSRP reporting period | 1 |  | slot320 | slot320 |
| Propagation condition | 1 |  | AWGN | AWGN |
| Antenna configuration | 1 |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

Table 7.7.4.2.5-2: L1-RSRP OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1 | dBm/15kHz | -104.10 | | n.a. | |
|  | 1 | dBm/SSB SCS | -95.11 | | n.a.  n.a. | |
|  | 1 | dB | 10 | -1.8 | n.a. | |
| CSI-RS\_RPNote1 | 1 | dBm/SCS | -85.11 | -96.93 | As in Table B.2.4.2-2 + 5.7 | |
| IoNote1 | 1 | dBm/  95.04MHz | -55.67 | | CSI-RS\_RP+34.68 | |
|  | 1 | dB | 10 | -1.82 | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

Table 7.7.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3

|  |  |  |  |
| --- | --- | --- | --- |
| UE power class 3 | | | |
| Normal Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (CSI-RS0) | 42 | n257, n258, n261 | 27 |
| n260 | 30 |
| n259 | FFS |
| Highest reported value (CSI-RS0) | 101 | n257, n258, n261 | 83 |
| n260 | 86 |
| n259 | FFS |
| Extreme Conditions | Test 1  All bands | Test 2 | |
| Lowest reported value (CSI-RS0) | 39+ FFS | n257, n258, n261 | 25 + FFS |
| n260 | 27 + FFS |
| n259 | FFS |
| Highest reported value (CSI-RS0) | 104+ FFS | n257, n258, n261 | 86 + FFS |
| n260 | 89 + FFS |
| n259 | FFS |

Table 7.7.4.2.5-3a: evaluation limits for the ∆(Max-Min) reported values for CSI-RS#0 for rules R1

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value CSI-RS#0 | 18 | 18 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value CSI-RS#0 | 18 + FFS | 18+ FFS |

Table 7.7.4.2.5-3b: evaluation limits for the ∆(Max-Min) reported values for CSI-RS#0 or CSI-RS#1 for rules R3

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 | 18 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| ∆(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 + FFS | 18+ FFS |

Table 7.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

|  |  |  |
| --- | --- | --- |
| UE power class 3 | | |
| Normal Conditions | Test 1  All bands | Test 2  All bands |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | 4 |
| Extreme Conditions | Test 1  All bands | Test 2  All bands |
| Lowest DIFF RSRP reported value | 0+ FFS | 0+ FFS |
| Highest DIFF RSRP reported value | 12+ FFS | 7+ FFS |

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.

### 7.7.5 SRS-RSRP

#### 7.7.5.0 Minimum conformance requirements

##### 7.7.5.0.1 Minimum conformance requirements for SRS-RSRP measurement accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 7.7.5.0.1-1 for FR1 and Table 5.7.7.0.1-2 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 Terror\_SRS\_RSRP, where

- Terror\_SRS\_RSRP = TC × NTA\_offset + 4.67us for FR1

- Terror\_SRS\_RSRP = TC × NTA\_offset + 3.67us for FR2

- NTA\_offset is defined in Table 7.1.2-2

- TC is 0.509ns

- The number of SRS ports in the SRS resource configured for measurement is 1,

- The number of symbols in the SRS resource configured for measurement is 1,

- The number of repetitions in the SRS resource configured for measurement is 1,

- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,

- The bandwidth of the SRS resource is 48 PRBs.

- One of the following conditions is met

- There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.

- If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

Table 7.7.5.0.1-1: SRS-RSRP absolute accuracy in FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | | | | | Conditions | | | | | | |
| Normal condition | | | Extreme condition | | | SRS Ês/Iot | Io Note 1 range | | | | | |
|  | | |  | | |  | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | | | | | | dB |  | dBm / SCSSRS | | | dBm/BW Channel | dBm/BW Channel |
| SCSSRS (kHz) | | | SCSSRS (kHz) | | |  |  |  | | |  |  |
| 15 | 30 | 60 | 15 | 30 | 60 |  |  | SCSSRS = 15 kHz | SCSSRS = 30 kHz | SCSSRS = 60 kHz |  |  |
| ±3 | ±3.5 | ±5 | ±7.5 | ±8 | ±9.5 | ≥1 | NR\_TDD\_FR1\_A, | -120 | -117 | -114 | N/A | -70 |
|  |  |  |  |  |  |  | NR\_TDD\_FR1\_C | -119 | -116 | -113 | N/A | -70 |
|  |  |  |  |  |  |  | NR\_TDD\_FR1\_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
|  |  |  |  |  |  |  | NR\_TDD\_FR1\_E | -118 | -115 | -112 | N/A | -70 |
| ±6.5 | ±7 | ±8.5 | ±9.5 | ±10 | ±11.5 | ≥1 | NR\_TDD\_FR1\_A,  NR\_TDD\_FR1\_C, NR\_TDD\_FR1\_D, NR\_TDD\_FR1\_E | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | | | | | |

Table 7.7.5.0.1-2: SRS-RSRP absolute accuracy in FR2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | | | Conditions | | | | |
| Normal condition | | Extreme condition | | SRS Ês/Iot | Io Note 1 range | | | |
|  | |  | |  | Minimum Io | | | Maximum Io |
| dB | | | | dB | dBm / SCSSRS Note 2 | | dBm/BWChannel | dBm/BWChannel |
| SCSSRS (kHz) | | SCSSRS (kHz) | |  | SCSSRS = | SCSSRS = |  |  |
| 60 | 120 | 60 | 120 |  | 60kHz | 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 Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | | |

7.7.5.0.1.1 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 5.7.7.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 5.7.7.0.1.2-1: 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.

#### 7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.

- MU/TT analysis for UE power class other than PC3 is incomplete.

- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

7.7.5.1.1 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.

7.7.5.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-SRS-RSRP.

7.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.1.

7.7.5.1.4 Test description

7.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.1.4.1-1.

Table 7.7.5.1.4.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test

|  |  |
| --- | --- |
| Config | Description |
| 1 | 120 kHz SRS SCS, 100 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 7.7.5.1.4.1-2.

Table 7.7.5.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.7.5.1.4.3.

2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.1.5-1 and Table 7.7.5.1.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.1.5-2.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.5.1.4 Test description

7.7.5.1.4.1 Initial conditions

7.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.5.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.7.5.1.4.3 Message contents

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

FFS

7.7.5.1.5 Test requirement

Table 7.7.5.1.5-1 defines the cell specific settings for all tests. Table 7.7.5.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.7.5.1.5-1: FR2 test parameters for SRS-RSRP accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | 1 |  | freq1 | freq1 |
| Duplex mode | 1 |  | TDD | TDD |
| TDD configuration | 1 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR2 | SSB.3 FR2 |
| OCNG Patterns | 1 |  | OP.1 | OP.1 |
| TRS configuration | 1 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1 |  | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | 1 | μs | 10.76 | 10.67 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |
| Propagation condition | 1 |  | AWGN | AWGN |
| Antenna configuration | 1 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

Table 7.7.5.1.5-2: SRS-RSRP accuracy OTA related test parameters for PCell and Neighbour cell UE in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | T1 | T2 |
| Angle of arrival configuration |  | Setup 1 defined A.9.1 | Setup 1 defined A.9.1 |
| Beam assumption Note 5 |  | Fine | Fine |
| Note1 | dBm/15kHzNote3 | -100 | N/A |
| Note1 | dBm/SCSNote3 | -91 | N/A |
|  | dB | 2 | N/A |
| Es | dBm/SCSNote3 |  | (Table B.2.7-2 Rx Beam Peak) +5 |
| SRS\_RPNote2 | dBm/SCS | -89 | (Table B.2.7-2 Rx Beam Peak) +5 |
| BB Note4 | dB | >1 | 1 |
| IoNote2 | dBm/95.04 MHz Note3 | -57.89 | (Table B.2.7-2 Rx Beam Peak +50.79dB) |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SRS\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor ∑MBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | |

Table 7.7.5.1.5-3: SRS configuration parameters for FR2 SRS-RSRP accuracy

|  |  |  |
| --- | --- | --- |
|  | Field | SRSConf.1 |
| SRS-ResourceSet | srs-ResourceSetId | 0 |
|  | srs-ResourceIdList | 0 |
|  | resourceType | Periodic |
|  | Usage | Codebook |
| SRS-Resource | SRS-ResourceId | 0 |
|  | nrofSRS-Ports | Port1 |
|  | transmissionComb | n2 |
|  | combOffset-n2 | 0 |
|  | cyclicShift-n2 | 0 |
|  | resourceMapping  startPosition | 0 |
|  | resourceMapping  nrofSymbols | n1 |
|  | resourceMapping  repetitionFactor | n1 |
|  | freqDomainPosition | 0 |
|  | freqDomainShift | 0 |
|  | freqHopping  c-SRS | 12 |
|  | freqHopping  b-SRS | 0 |
|  | freqHopping  b-hop | 0 |
|  | groupOrSequenceHopping | Neither |
|  | resourceType | Periodic |
|  | periodicityAndOffset-p | sl160,25 |
|  | sequenceId | 0 |

Table 7.7.5.1.5-4: SRS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| SRS | SRS\_RP -δ +Gmin ≤ Reported SRS-RSRP(dBm) ≤SRS\_RP +δ +Gmax |
| Note 1: SRS\_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 7.7.5.0. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

#### 7.7.5.2 NR SA FR2 CLI-RSSI measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

##### 7.7.5.2.1 Test purpose

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits with CLI-RSSI measurement requirements in TS 38.133 [6] clause 10.1.22.2.1.

##### 7.7.5.2.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-RSSI.

##### 7.7.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.2.

##### 7.7.5.2.4 Test description

7.7.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.2.4.1-1.

Table 7.7.5.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test

|  |  |
| --- | --- |
| Config | Description |
| 1 | 120 kHz SRS SCS, 100 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 7.7.5.2.4.1-2.

Table 7.7.5.2.4.1-2: Initial conditions SA FR2 CLI-RSSI measurement 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.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.4.1.1 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 7.7.5.2.4.3.

2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.2.5-1 and Table 7.7.5.2.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.2.5-2.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.5.2.4 Test description

7.7.5.2.4.1 Initial conditions

7.7.5.2.4.2 Test procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.5.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.7.5.2.4.3 Message contents

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

FFS

##### 7.7.5.2.5 Test requirement

Table 7.7.5.2.5-1 defines the cell specific settings for all tests. Table 7.7.5.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.7.5.2.5-1: : FR2 test parameters for CLI-RSSI accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | 1 |  | freq1 | freq1 |
| Duplex mode | 1 |  | TDD | TDD |
| TDD configuration | 1 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR2 | SSB.3 FR2 |
| OCNG Patterns Note2 | 1 |  | OP.1 | OP.1 |
| TRS configuration | 1 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1 |  | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1 | μs | 10.67 | 10.67 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |
| Propagation condition | 1 |  | AWGN | AWGN |
| Antenna configuration | 1 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

Table 7.7.5.2.5-2: CLI-RSSI accuracy OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | T1 | T2 |
| Angle of arrival configuration |  | Setup 1 defined A.9.1 | |
| Beam assumption Note 5 |  | Fine | |
| on CLI-RSSI measurement resource Note1 | dBm/15kHzNote3 | -100+TT | |
| on CLI-RSSI measurement resource Note1 | dBm/SCSNote3 | -91 | |
| on CLI-RSSI measurement resource | dB | -Infinity | |
| RSRP on CLI-RSSI measurement resource Note2 | dBm/SCS | -Infinity | |
| BBon CLI-RSSI measurement resource Note4 | dB | -Infinity | |
| Io on CLI-RSSI measurement resource Note2 | dBm/95.04 MHz Note3 | -62.01 | |
| Io on CLI-RSSI measurement resource Note2 | dBm/1.08 MHz | -81.46 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SRS\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor ∑MBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | |

Table 7.7.5.2.5-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy

|  |  |  |
| --- | --- | --- |
|  | Field | SRSConf.1 |
| CLI-RSSI measurement resource | rssi-ResourceId | 0 |
|  | rssi-SCS | 120kHz |
|  | startPRB | 0 |
|  | nrofPRBs | 66 |
|  | startPosition | 3 |
|  | nrofSymbols | 11 |
|  | rssi-PeriodicityAndOffset | sl160, 25 |

Table 7.7.5.2.5-4: CLI-RSSI absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
|  | Io -δ +Gmin ≤ Reported CLI-RSSI(dBm) ≤Io +δ +Gmax |
| Note 1: Io is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 7.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 7.7.5.2.5-4.

### 7.7.6 L1-SINR

#### 7.7.6.0 Minimum conformance requirements

##### 7.7.6.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

Dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only is defined in Table 7.7.6.0.1-1 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 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 FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion (TCSI-RS < MGRP)

- P=, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and

- TSMTCperiod ≠ MGRP or

- TSMTCperiod = MGRP and TCSI-RS < 0.5\*TSMTCperiod

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and TSMTCperiod = MGRP and TCSI-RS = 0.5\*TSMTCperiod

- P=, when CSI-RS is partially overlapped with measurement gap (TCSI-RS < MGRP) and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gap.

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with measurement gap (TSMTCperiod < MGRP)

Where:

TSMTCperiod = the configured SMTC1 period or SMTC2 period if configured.

TCSI-RS = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

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

Table 7.7.6.0.1-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only (ms) |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The accuracy requirements in Table 7.7.6.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] 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.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- 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 7.7.6.0.1-3.

Table 7.7.6.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | CSI-RS  CMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±5.5 | ±6.5 | ≥-3 | Same value as CSI-RS\_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival | | N/A | -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 CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.28.1.

##### 7.7.6.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR is defined in Table 7.7.6.0.2-1 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between PCMR and PIMR, i.e., P = max(PCMR, PIMR), where

- the value of PCMR shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of PIMR shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

Table 7.7.6.0.2-1: Measurement period TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] 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.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3.

Table 7.7.6.0.2-2: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB  CMR  Ês/Iot Note 3 | NZP-IMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | dBm / SCSSSB Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as SSB\_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -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 Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

Table 7.7.6.0.2-3: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | SSB  CMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSSSB Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±4.5 | ±5.5 | ≥-3 | Same value as SSB\_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -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 CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.28.2.

##### 7.7.6.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR is defined in Table 7.7.6.0.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if

- aperiodic NZP-CSI-RS as CMR or dedicated IMR, or

- aperiodic CSI-IMR as dedicated IMR, or

- periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or

- periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;

- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between PCMR and PIMR, i.e., P = max(PCMR, PIMR), where

- The value of PCMR and PIMR shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

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

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 7.7.6.0.3-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR (ms) |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.  Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] 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.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- CSI-RS based CMR and IMR in the test come from the same direction.

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 7.7.6.0.3-2 and 7.7.6.0.3-3.

Table 7.7.6.0.3-2: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | NZP-IMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | dBm / SCSCSI-RS Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as CSI-RS\_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -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 CSI-RS Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

Table 7.7.6.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±4.5 | ±5.5 | ≥-3 | Same value as CSI-RS\_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -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 CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.28.3.

#### 7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for test frequencies > 40.8 GHz

7.7.6.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.1.

7.7.6.1.4 Test description

7.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.1.4.1-1.

Table 7.7.6.1.4.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.1.4.1-2.

Table 7.7.6.1.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. Message contents are defined in clause 7.7.6.1.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the CSI-RS based L1-SINR measurements. The UE is configured to perform RLM and BFD measurement based on the CSI-RS.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.1.4.2 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 7.7.6.1.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, 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 7.7.6.1.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS with a periodicity of 20 slots.

4. The SS shall check following requirements:

- R1: the L1-SINR 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 7.7.6.1.5-2 or Table 7.7.6.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

- 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 7.7.6.1.5-4 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 7.7.6.1.5-4 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. 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 7.7.6.1.5-1 as appropriate and repeat steps 3-5.

7.7.6.1.4.3 Message contents

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

Table 7.7.6.1.4.3-1: Common Exception messages NR SA 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.3.6A-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 7.7.6.1.4.3-2: 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. |  |
| } |  |  |  |
| } |  |  |  |

7.7.6.1.5 Test requirement

Table 7.7.6.1.5-1 defines the primary level settings excluding test tolerances for all tests. (Refer to Sec. 7.7.3.1.5)

Each L1-SINR measurement report for each of the tests in Table 7.7.6.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 for test configuration 3.

Table 7.7.6.1.5-1: FR2 CSI-RS based L1-SINR general test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| SMTC configuration | 1 |  | SMTC.1 |
| CSI-RS | 1 |  | CSI-RS.3.2 TDD |
| reportConfigType | 1 |  | periodic |
| reportQuantity | 1 |  | cri-SINR-r16 |
| nrofReportedRS | 1 |  | 2 |
| L1-SINR reporting period | 1 |  | slot80 |
| Propagation condition | 1 |  | AWGN |
| Antenna configuration | 1 |  | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | |

Table 7.7.6.1.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | | **Unit** | **Test 1** | |
| **CSI-RS0** | **CSI-RS1** |
| Angle of arrival configuration |  | |  | Setup 1 according to A.9.1 | |
| Assumption for UE beamsNote 4 | |  |  | Rough | |
|  | 1~2 | | dBm/15kHz | -104.1 | |
|  | 1~2 | | dBm/SSB SCS | -95.1 | |
|  | 1~2 | | dB | 10 | -1.8 |
| CSI-RS-RSRPNote1 | 1~2 | | dBm/SCS | -85.07 | -96.87 |
| IoNote1 | 1~2 | | dBm/  95.04MHz | -55.67 | -63.88 |
|  | 1~2 | | dB | 10 | -1.8 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: Void.  Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 and the corresponding relative accuracy requirements in Table 7.7.6.1.5-4.

Table 7.7.6.1.5-3: L1-SINR absolute accuracy requirements for the reported values R1

|  |  |
| --- | --- |
| UE power class 3 | |
| Normal Conditions | Test 1  All bands |
| Lowest reported value (CSI-RS0) | 53 |
|
|
| Highest reported value (CSI-RS0) | 76 |
|
|
|
|
| Extreme Conditions | Test 1  All bands |
| Lowest reported value (CSI-RS0) | 51 |
|
|
| Highest reported value (CSI-RS0) | 78 |
|
|
|
|

Table 7.7.6.1.5-4: L1-SINR relative accuracy requirements for the reported values R2 and R3

|  |  |
| --- | --- |
| UE power class 3 | |
| Normal Conditions | Test 1  All bands |
| Lowest DIFF SINR reported value | 6 |
| Highest DIFF SINR reported value | 15 |
| Extreme Conditions | Test 1  All bands |
| Lowest DIFF SINR reported value | 5 |
| Highest DIFF SINR reported value | 15 |

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.

#### 7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.6.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.2.

7.7.6.2.4 Test description

7.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.2.4.1-1.

Table 7.7.6.2.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 240 kHz SSB SCS, 100 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 7.7.6.2.4.1-2.

Table 7.7.6.2.4.1-2: Initial conditions for SSB based L1-SINR absolute accuracy in FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.6.2.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. Message contents are defined in clause 7.7.6.2.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The 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..

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.2.4.2 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 7.7.6.2.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.7.6.2.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

- R1: the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 7.7.6.2.5-2 and Table 7.7.6.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

- R2: the L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#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 SSB#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#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. 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 7.7.6.2.5-1 as appropriate and repeat steps 3-5.

7.7.6.2.4.3 Message contents

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

Table 7.7.6.2.4.3-1: Common Exception messages NR SA 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.3.6A-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-3 with condition PERIODIC  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 7.7.6.2.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

7.7.6.2.5 Test requirement

Table 7.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.6.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.2.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.2.5-3 for test configuration 3.

Table 7.7.6.2.5-1: FR2 L1-SINR general test parameters with SSB based CMR and CSI-IM based IMR

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| 2 | SSB.2 FR2 |
| CSI-IM configuration | 1~2 |  | CSI-IM 3.1 TDD |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity-r16 | 1~2 |  | ssb-Index-SINR-r16 |
| Number of reported RS | 1~2 |  | 2 |
| L1-SINR reporting period | 1~2 |  | slot640 |
| Propagation condition | 1~2 |  | AWGN |
| Antenna configuration | 1~2 |  | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | |

Table 7.7.6.2.5-2: FR2 L1-SINR SSB specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| SSB0 | SSB1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.9.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | |
|  | 1~2 | dBm/15kHz | -104.1 | |
|  | 1 | dBm/SSB SCS | -95.1 | |
| 2 | 92.1 | |
|  | 1~2 | dB | 10 | 1.8 |
| SS-RSRPNote1 | 1 | dBm/SCS | -85.07 | -96.87 |
| 2 | -82.06 | -93.86 |
| IoNote1 | 1~2 | dBm/95.04 MHz | -55.67 | |
|  | 1~2 | dB | 10 | -1.8 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 1 shall meet the corresponding absolute accuracy of SSB#0+CSI-IM#0 and absolute accuracy of SSB#1+CSI-IM#1 in Table 7.7.6.2.5-3. The corresponding relative accuracy requirements in Table 7.7.6.2.5-4

Table 7.7.6.2.5-3: L1-SINR absolute accuracy test requirement R1

|  |  |
| --- | --- |
| UE power class 3 | |
| Normal Conditions | Test 1  All bands |
| Lowest reported value (CSI-RS0) | 55 |
|
|
| Highest reported value (CSI-RS0) | 74 |
|
|
|
| Extreme Conditions | Test 1  All bands |
| Lowest reported value (CSI-RS0) | 53 |
|
|
| Highest reported value (CSI-RS0) | 76 |
|
|
|

Table 7.7.6.2.5-4: L1-SINR relative accuracy requirements for the reported values R2 and R3

|  |  |
| --- | --- |
| UE power class 3 | |
| Normal Conditions | Test 1  All bands |
| Lowest DIFF SINR reported value | 7 |
| Highest DIFF SINR reported value | 15 |
| Extreme Conditions | Test 1  All bands |
| Lowest DIFF SINR reported value | 6 |
| Highest DIFF SINR reported value | 15 |

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.

#### 7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

Editor’s note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.6.3.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.3.

7.7.6.3.4 Test description

7.7.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.3.4.1-1.

Table 7.7.6.3.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based both CMR based IMR

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.3.4.1-2.

Table 7.7.6.3.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Comment |
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.6.3.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1  DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A |  |

1. Message contents are defined in clause 7.7.6.3.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured 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.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.3.4.2 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 7.7.6.3.4.1-2.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR SA, 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 7.7.6.3.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

- R1: the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 is within the limits in Table 7.7.6.3.5-2 and Table 7.7.6.3.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

- 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 7.7.6.3.5-4 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 7.7.6.3.5-4 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. 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 7.7.6.3.5-1 as appropriate and repeat steps 3-5.

7.7.6.3.4.3 Message contents

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

Table 7.7.6.3.4.3-1: Common Exception messages NR SA 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.3.6A-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 7.7.6.3.4.3-2: RadioLinkMonitoringConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { |  |  |  |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry |  |  |
| purpose | both | UE is configured to perform RLM and BFD based on the SSB. |  |
| } |  |  |  |
| } |  |  |  |

7.7.6.3.5 Test requirement

Table 7.7.6.3.5-1 defines the primary level settings excluding test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 7.7.6.3.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.3.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.3.5-3 for test configuration 3.

Table 7.7.6.3.5-1: FR2 L1-SINR measurement test with CSI-RS based both CMR and IMR

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| SMTC configuration | 1 |  | SMTC.1 |
| CSI-RS configuration as CMR | 1 |  | CSI-RS.3.2 TDD |
| CSI-RS configuration as IMR | 1 |  | CSI-RS.3.3A TDD |
| reportConfigType | 1 |  | periodic |
| reportQuantity-r16 | 1 |  | cri-SINR-r16 |
| nrofReportedRS | 1 |  | 2 |
| L1-RSRP reporting period | 1 |  | slot80 |
| Propagation condition | 1 |  | AWGN |
| Antenna configuration | 1 |  | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | |

Table 7.7.6.3.5-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
|  |  |  | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.9.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | |
|  | 1~2 | dBm/15kHz | -104.1 | |
|  | 1~2 | dBm/SSB SCS | -95.1 | |
|  | 1~2 | dB | 10 | 0.2 |
| CSI-RS-RSRPNote1 | 1~2 | dBm/SCS | -85.07 | -94.87 |
| IoNote1 | 1~2 | dBm/  95.04MHz | -55.67 | -62.97 |
|  | 1~2 | dB | 10 | 0.2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 1 shall meet the corresponding absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1 in Table 7.7.6.3.5-3. The corresponding relative accuracy of CSI-RS#0 compared with CSI-RS#1 in Table 7.7.6.3.5-4.

Table 7.7.6.3.5-3: L1-SINR absolute accuracy test requirement R1

|  |  |
| --- | --- |
| UE power class 3 | |
| Normal Conditions | Test 1  All bands |
| Lowest reported value (CSI-RS0) | 55 |
|
|
| Highest reported value (CSI-RS0) | 74 |
|
|
|
| Extreme Conditions | Test 1  All bands |
| Lowest reported value (CSI-RS0) | 53 |
|
|
| Highest reported value (CSI-RS0) | 76 |
|
|
|

Table 7.7.6.3.5-4: L1-SINR relative accuracy test requirement for the reported values R2 and R3

|  |  |
| --- | --- |
| UE power class 3 | |
| Normal Conditions | Test 1  All bands |
| Lowest DIFF SINR reported value | 5 |
| Highest DIFF SINR reported value | 13 |
| Extreme Conditions | Test 1  All bands |
| Lowest DIFF SINR reported value | 4 |
| Highest DIFF SINR reported value | 14 |

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.