**3GPP TSG- Meeting # *R5-25***

**Malta, Malta, 19th May 2025 - 23rd May 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.533** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **18.6.1** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | RRM Spec quality improvement draft CR clauses 14 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Keysight Technologies | | | | | | | | | |
| ***Source to TSG:*** | R5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NTN\_solutions\_plus\_CT-UEConTest | | | | |  | ***Date:*** | | | 2025-05-08 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19) Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | According to the agreed WF in R5-251000, the identified issues are to be corrected. Per the work split, the CR is for clause 14.  Alignment with TS 38.133 v17.17.0 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Some errors/ inconsistency in the spec. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 14 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## <<< START OF CHANGES >>>

# 14 NR standalone tests for Satellite access

## 14.0 General

The Satellite Access tests defined in this clause apply provided that UE indicates *nonTerrestrialNetwork* and is accessing a cell served by a Satellite Access Node (SAN). The requirements apply provided that serving and all neighbour satellites on the same layer are of same satellite type (LEO or GEO).

### 14.0.1 Principle of testing GSO and NGSO scenarios

The test cases related to satellite access are defined for both GSO and NGSO. The testing principle for these test cases is as follows:

- A UE capable of GSO only is required to pass the test cases with GSO.

- A UE capable of NGSO only is required to pass the test cases with NGSO.

- A UE capable of both GSO and NGSO is required to pass the test cases with NGSO only.

Support of GSO and NGSO scenario is indicated via *ntn-ScenarioSupport-r17*.

### 14.0.2 Principle of testing different RRM requirements

Satellite Access RRM test cases are defined for all applicable RRM requirements. The testing principle for these test cases is as follows:

- A UE capable of NTN only is required to pass all the test cases defined in clause 14.

- A UE capable of both TN and NTN is required to pass the test cases for NTN specific requirements in Table 14.0.2-1.

Table 14.0.2-1: Test cases for NTN specific requirements

|  |  |
| --- | --- |
| Clause | Test case slogan |
| 14.1.2 | SA FR1 Cell reselection for UE configured with [capability for enhanced requirements] for NR satellite access |
| 14.1.3 | SA FR1 Time-based cell reselection for NR satellite access |
| 14.1.4 | SA FR1 Location-based cell reselection for NR satellite access |
| 14.1.7 | SA FR1-FR1 Cell reselection for UE configured with [capability for enhanced requirements] for NR satellite access |
| 14.1.8 | SA FR1-FR1 Time-based Cell reselection for NR satellite access |
| 14.1.9 | SA FR1-FR1 Location-based Cell reselection for NR satellite access |
| 14.2.1.3 | SA FR1 SAN time-based conditional Handover for NR satellite access |
| 14.2.1.4 | SA FR1-FR1 SAN time-based conditional Handover for NR satellite access |
| 14.2.1.5 | SA FR1 SAN distance-based conditional Handover for NR satellite access |
| 14.2.1.6 | SA FR1-FR1 SAN distance-based conditional Handover for NR satellite access |
| 14.3.1.1 | SA FR1 NR UE Transmit Timing Test for NR satellite access |
| 14.5.1.1 | SA FR1 event triggered reporting tests without gap under non-DRX for NR satellite access |
| 14.5.1.2 | SA FR1 event triggered reporting tests without gap under DRX for NR satellite access |
| 14.5.1.3 | SA FR1 event triggered reporting tests without gap under non-DRX with SSB index reading for NR satellite access |
| 14.5.1.4 | SA FR1 event triggered reporting tests with single measurement gap under non-DRX for satellite access for NR satellite access |
| 14.5.1.5 | SA FR1 event triggered reporting tests with FNO concurrent gaps under DRX for satellite access for NR satellite access |
| 14.5.1.6 | SA FR1 event triggered reporting tests with PPO concurrent gaps under non-DRX with SSB index reading for satellite access for NR satellite access |
| 14.5.2.1 | SA FR1-FR1 Event triggered reporting test with single measurement gap under non-DRX for NR satellite access |
| 14.5.2.2 | SA FR1-FR1 Event triggered reporting tests with single measurement gap under DRX for NR satellite access |
| 14.6.3.1 | SA FR1 SS-SINR measurement accuracy for NR satellite access |
| 14.6.3.2 | SA FR1-FR1 SS-SINR measurement accuracy for NR satellite access |
| 14.6.4.1 | SA FR1 SSB based L1-RSRP measurement for NR satellite access |
| 14.6.4.2 | SA FR1 CSI-RS based L1-RSRP measurement on resource set with repetition off for NR satellite access |

### 14.0.3 Principle of testing different ephemeris formats

Satellite access RRM test cases are defined such that satellite ephemeris information is sent to UE in each test case, according to Tables 14.0.3-1 and 14.0.3-2.

Table 14.0.3-1: Test cases configuring EphemerisInfo as PositionVelocity

|  |  |
| --- | --- |
| Functional Area | Test Case |
| RRC\_IDLE state mobility | 14.1.3 |
| 14.1.4 |
| 14.1.5 |
| 14.1.6 |
| 14.1.9 |
| 14.1.10 |
| Handover | 14.2.1.3 |
| 14.2.1.4 |
| 14.2.1.5 |
| 14.2.1.6 |
| Timing | 14.3.1 |
| Radio Link Monitoring | 14.4.1.1 |
| 14.4.1.2 |
| 14.4.1.5 |
| 14.4.1.6 |
| BFD and LR procedures | 14.4.2.1 |
| 14.4.2.3 |
| 14.4.2.5 |
| Active BWP switch | 14.4.3.1 |
| UE specific CBW change | 14.4.4.1 |
| PL-RS switching delay | 14.4.5.1 |
| Intra-frequency measurements | 14.5.1.1 |
| 14.5.1.3 |
| 14.5.1.5 |
| Inter-frequency measurements | 14.5.2.1 |
| 14.5.2.3 |
| 14.5.2.7 |
| L1-RSRP measurements | 14.5.3.1 |
| 14.5.3.3 |
| SS-RSRP accuracy | 14.6.1.1 |
| SS-RSRQ accuracy | 14.6.2.1 |
| SS-SINR accuracy | 14.6.3.1 |
| L1-RSRP accuracy | 14.6.4.1 |

Table 14.0.3-2: Test cases configuring EphemerisInfo as Orbital

|  |  |
| --- | --- |
| Functional Area | Test Case |
| RRC\_IDLE state mobility | 14.1.1 |
| 14.1.2 |
| 14.1.5 |
| 14.1.6 |
| Handover | 14.2.1.1 |
| 14.2.1.2 |
| RRC Connection Mobility Control | 14.2.2.1 |
| 14.2.2.2 |
| 14.2.2.3 |
| Timing | 14.3.2 |
| Radio Link Monitoring | 14.4.1.3 |
| 14.4.1.4 |
| 14.4.1.7 |
| 14.4.1.8 |
| BFD and LR procedures | 14.4.2.2 |
| 14.4.2.4 |
| 14.4.2.6 |
| Active BWP switch | 14.4.3.2 |
| Intra-frequency measurements | 14.5.1.2 |
| 14.5.1.4 |
| 14.5.1.6 |
| Inter-frequency measurements | 14.5.2.2 |
| 14.5.2.4 |
| 14.5.2.6 |
| 14.5.2.8 |
| L1-RSRP measurements | 14.5.3.2 |
| 14.5.3.4 |
| SS-RSRP accuracy | 14.6.1.2 |
| SS-RSRQ accuracy | 14.6.2.2 |
| SS-SINR accuracy | 14.6.3.2 |
| L1-RSRP accuracy | 14.6.4.2 |

### 14.0.4 General setup for SIB19

The general parameters for SIB19 setup is specified in Table 14.0.4-1.

Table 14.0.4-1: SIB19 configuration for NTN test cases

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| Interval between adjacent epoch time | s | LEO: 2.56  GEO: 10.24 |
| ntn-UlSyncValidityDuration | s | LEO: 5  GEO: 900 |
| cellSpecificKoffset | slot | LEO: 8  GEO: 256 |
| kmac | slot | Not configured |
| ta-Common |  | 0 |
| ta-CommonDrift |  | 0 |
| ta-CommonDriftVariant |  | 0 |
| ntn-PolarizationDL |  | linear |
| ntn-PolarizationUL |  | linear |
| ephemerisInfo |  | Detailed ephemeris information is provided in TS 38.508-1 [14] |
| ta-Report |  | Not configured |

### 14.0.5 Initial test environment conditions for RRM NTN tests

The following initial conditions apply to all RRM satellite access specified in this section, unless otherwise specified in the test:

1. UE location according to TS 38.508-1 [14] clause 7.6.1 is provided to the UE through any preconfigured means.

2. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 38.508-1 [14] Tables 7.6.2.1-1a and 7.6.2.1-1b for GSO at 30º elevation angle conditions for GSO configurations or Tables 7.6.2.1-2a and 7.6.2.1-2b for NGSO (LEO-600) at 30º elevation angle conditions for NGSO (LEO-600) configurations or Tables 7.6.2.1-3a and 7.6.2.1-3b for NGSO (LEO-1200) at 30º elevation angle conditions for NGSO (LEO-1200) configurations. Test system shall send same SIB19 information during the duration of the test as defined in TS 38.508-1 [14] clause 7.6.3.1.

3. Deactivate UE prediction of satellite trajectory by any preconfigured means.

Unless otherwise specified in the test, all multi-cell RRM test cases in clause 14 are configured such that all involved NR NTN cells belong to the same satellite.

## 14.1 RRC\_IDLE state mobility

### 14.1.0 Minimum conformance requirements

#### 14.1.0.1 Measurements of intra-frequency NR cells

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.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if the *distanceThresh* is configured (see TS 38.304 [30]) and UE has location information, then the UE is not required to perform measurement of intra-frequency.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [30] within Kmulti\_SMTC \* Tdetect,NR\_Intrawhen that Treselection= 0 if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within Kmulti\_SMTC \* Tdetect,NR\_Intra\_enhif the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled. An intra frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.6 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every Kmulti\_SMTC \* Tmeasure,NR\_Intra (see table 14.1.0.1-1) if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or every Kmulti\_SMTC \* Tmeasure,NR\_Intra\_enh (see table 14.1.0.1-2) if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, 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.

If smtcs do not overlap with each other,

- , if GEO satellites are measured on the carrier;

- , if LEO satellites are measured on the carrier;

- If smtcs partially overlap with each other,

- , if only GEO satellites are measured on the carrier;

- , if only LEO satellites are measured on the carrier;

Where

- Is the number of LEO satellites to be measured within i-th SMTC,

- Is the number of LEO satellites that UE can measure in parallel within an SMTC,

- Is the number of smtcs that partially overlap with each other.

Note: for deriving Kmulti\_SMTC for Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra, two SMTCs are considered as overlapping if they overlap in one or more occasions during a single Tdetect,NR\_Intra, Tmeasure,NR\_Intra or Tevaluate,NR\_Intra.

The parameter Kmulti\_SMTC is the scaling factor for measurements of multiple SMTCs which correspond to different satellites.

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 in TS 38.304 [30] within Kmulti\_SMTC \* Tevaluate,NR\_Intra if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within Kmulti\_SMTC \* Tevaluate,NR\_Intra\_enh if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, when Treselection = 0as specified in table 14.1.0.1-1 or table 14.1.0.1-2 provided that:

- when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2.

- when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

- if there are multiple such cells, the cell has the highest rank among them.

- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2 if the current serving cell is among them.

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

If Treselection timer has a nonzero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS 38.304 [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.

Table 14.1.0.1-1: Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | **Tdetect,NR\_Intra [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of DRX cycles)** |
|  | **FR1** |  |  |  |
| 0.32 | 1 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: M2 = 2 if SMTC periodicity of measured intra-frequency cell > 20 ms and 1<NSMTC ≤ 4 upon more than 1 SMTC configured at the UE; M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms and NSMTC=1 upon 1 SMTC configured at the UE; otherwise M2=1. Where, NSMTC is the number of SMTCs configured by SAN If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer Tdetect, NR\_intra is expected.  Note 2: The UE is not required to meet the requirements for 2.56s DRX cycle length for earth-moving LEO deployment. | | | | |

Table 14.1.0.1-2: Tdetect,NR\_Intra\_enh, Tmeasure,NR\_Intra\_enh and Tevaluate,NR\_Intra\_enh

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Tdetect,NR\_Intra\_enh [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra\_enh [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra\_enh [s] (number of DRX cycles)** |
|
| 0.32 | 2.56 x M2 (8 x M2)Note 1 | 0.32 x M3 (1 x M3) Note 1 | 0.96 x M4 (3 x M4) Note 1 |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 2, M3 = M4 = 2.5 | | | |

If ‘*t-Service*’ is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location is met or the legacy Srxlev/Squal condition are met, and when to start the detection, measurement and evaluation on neighbour cells is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than Ttrigger.

Ttrigger = max(Tdetect,NR\_Intra, Kcarrier\* Tdetect,NR\_Inter),

where

- Kcarrier is the number of NR inter-frequency carriers indicated by the serving cell,

- Tdetect,NR\_Intra refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined Table 14.1.0.1-2,

- Tdetect,NR\_Inter refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined Table 14.1.0.2-2.

The requirements in this clause apply provided that the number of SMTCs for any inter-frequency carrier does not exceed the *parallelSMTC-r17*, otherwise UE may select one or subset of all the configured SMTCs sequentially for performing the measurements until all of the SMTCs can be measured. The selection of SMTCs to be used is up to UE implementation, and in this case, measurement period longer than the corresponding measurement period specified in Table 14.1.0.1-1 and Table 14.1.0.1-2 is expected.

The normative reference for this requirement is TS 38.133 [6] clause 4.2C.2.3.

#### 14.1.0.2 Measurements of inter-frequency NR cells

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, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if *distanceThresh* is configured and UE has location information, 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 TS 38.133 [6] clause 4.2C.2.9.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, or the distance between UE and serving cell reference location is larger than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. The requirements apply provided that the distance exceeds the *distanceThresh* by a margin of 50 m. 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 clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS 38.304 [30] within if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, 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 in FR1 for reselections based on ranking or [6]dB in FR1 for SS-RSRP reselections based on absolute priorities or [4]dB in FR1 for SS-RSRQ reselections based on absolute priorities. The parameter Kcarrier is the number of NR inter-frequency carriers indicated by the serving cell.

The parameter Kmulti\_SMTC,i is the scaling factor for measurement of multiple SMTCs or multiple satellites

- If SMTCs do not overlap with each other,

- , if GEO satellites are measured on the carrier;

- , if LEO satellites are measured on the carrier;

- If SMTCs partially overlap with each other,

- , if only GEO satellites are measured on the carrier;

- , if only LEO satellites are measured on the carrier;

where:

is the number of LEO satellites to be measured within i-th SMTC,

is the number of LEO satellites that UE can measure in parallel within an SMTC, is the number of SMTCs that partially overlap with each other.

Note: for deriving Kmulti\_SMTC,i for Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter of frequency layer *i*, two SMTCs are considered as overlapping if they overlap in one or more occasions during a single Tdetect,NR\_Inter, Tmeasure,NR\_Inter or Tevaluate,NR\_Inter.

An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.7 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 clause 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 (see table 14.1.0.2-1) if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or every (see table 14.1.0.2-2) if the UE supports the feature for enhanced RRM requirements defined in 38.306 [11] and the *enhancedMeasurementLEO-r17*is enabled, 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 38.304 [30] within if the UE does not support [capability for enhanced requirements] or if the [NW configuration for enhanced requirements] is not enabled, or within if the UE supports the feature for enhanced RRM requirements defined in 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, when Treselection = 0as specified in table 14.1.0.2-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

when *rangeToBestCell* is not configured:

- the cell is at least [5]dB better ranked in FR1 or.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

- if there are multiple such cells, the cell has the highest rank among them

- the cell is at least [5]dB better ranked in FR1 if the current serving cell is among them. or

- [6]dB in FR1 for SS-RSRP reselections based on absolute priorities or

- [4]dB in FR1 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 14.1.0.2-1 under the following conditions:

- TSMTC\_intra = TSMTC\_inter = 160 ms; where

- TSMTC\_intra is the periodicity of the SMTC configured for the intra-frequency carrier if no identified intra-frequency cell is in the PCI list of smtc2-LP on this intra-frequency carrier; TSMTC\_intra is the periodicity of the smtc2-LP configured for the intra-frequency carrier if at least one identified intra-frequency cell is in the PCI list of smtc2-LP on this intra-frequency carrier. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed for TSMTC\_intra. If the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer Tdetect, NR\_intra is expected.

- TSMTC\_inter is the actual SMTC periodicity used by the inter-frequency cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the inter-frequency carrier is assumed for TSMTC\_inter. If the actual SSB transmission periodicity is greater than the SMTC configured for the inter-frequency carrier, longer Tdetect, NR\_inter is expected.

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 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 1 ms before the start or up to 1 ms after the end of the paging occasion in TS 38.304 [30].

Table 14.1.0.2-1: Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX cycle length [s] | Scaling Factor (N1) | Tdetect,NR\_Inter [s] (number of DRX cycles) | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter [s] (number of DRX cycles) |
| FR1 |
| 0.32 | 1 | 11.52 x N1 x 1.5 (36 x N1 x 1.5) | 1.28 x N1 x 1.5 (4 x N1 x 1.5) | 5.12 x N1 x 1.5 (16 x N1 x 1.5) |
| 0.64 | 17.92x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: UE is not required to fulfil the requirements for 2.56s DRX cycle length for earth-moving LEO deployment. | | | | |

Table 14.1.0.2-2: Tdetect,NR\_Inter\_enh, Tmeasure,NR\_Inter\_enh and Tevaluate,NR\_Inter\_enh

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter\_enh [s] (number of DRX cycles) | Tmeasure,NR\_Inter\_enh [s] (number of DRX cycles) | Tevaluate,NR\_Inter\_enh [s] (number of DRX cycles) |
|
| 0.32 | [3.2 x M2 (10 x M2)] Note 1 | [0.32 x M3 ([1] x M3)] Note 1 | 0.96 x M4 (3 x M4) Note 1 |
| 0.64 | [6.4 (10)] | [0.64 (1)] | 1.92 (3) |
| 1.28 | [10.24 (8)] | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2 | | | |

If *t-Service* is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location or the legacy Srxlev/Squal condition are met, and when to start detection, measurement, and evaluation is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than Ttrigger, and Ttrigger = max(Tdetect,NR\_Intra, Kcarrier\* Tdetect,NR\_Inter) when serving cell is below the search threshold, and Ttrigger = max(Tdetect,NR\_Intra, Nlayer\* [60s]) when serving cell is above the search threshold, where

- Kcarrier is the number of NR inter-frequency carriers indicated by the serving cell,

- Nlayer is the total number of higher priority NR carrier frequencies broadcasted in system information,

- Tdetect,NR\_Intra refers to HST intra-frequency cell detection delay in IDLE/INACTIVE mode defined in TS 38.133 [6] Table 4.2.2.3-2,

- Tdetect,NR\_Inter refers to HST inter-frequency cell detection delay in IDLE/INACTIVE mode defined in TS 38.133 [6] Table 4.2.2.4-2.

The requirements in this clause apply provided that the number of SMTCs for any inter-frequency carrier does not exceed the *parallelSMTC-r17*, otherwise UE may select one or subset of all the configured SMTCs sequentially until all of the SMTCs can be measured, the selection of SMTCs to be used is up to UE implementation, and longer measurement delay than the corresponding measurement period specified in Table 14.1.0.2-1 and Table 14.1.0.2-2 is expected.

The requirements in this clause apply provided that the valid information for the satellite serving the target cell has been provided by the serving cell.

The requirements in this clause apply provided that SSB of neighbour cells are within the time shifted SMTC.

The normative reference for this requirement is TS 38.133 [6] clause 4.2C.2.4.

### 14.1.1 NR SA FR1 Cell Reselection for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Several test parameters and configuration are still in brackets

14.1.1.1 Test purpose

This test is to verify the requirement for the intra frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

14.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.1.

14.1.1.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.1.4.1-1, 14.1.1.4.1-3 and 14.1.1.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

14.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.1.4.1-1.

Table 14.1.1.4.1-1: Supported test configurations for NR SA FR1 Cell reselection for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.1.4.1-2

Table 14.1.1.4.1-2: Initial conditions for NR SA FR1 Cell reselection for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.1.1.4.1-3.

2. Message contents are defined in clause 14.1.1.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.1.4.1-3: General test parameters for NR SA FR1 Cell reselection for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | Cell 1 |  |
| T2 end condition | Active cell |  | Cell 2 |  |
|  | Neighbour cells |  | Cell 1 |  |
| Final condition | Active cell |  | Cell 1 |  |
|  | Neighbour cells |  | Cell 2 |  |
| RF Channel Number | |  | 1 |  |
| Time offset between cells | | ms | 3 | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | Not configured |  |
| Ephemeris information | |  | Note 1 |  |
| T1 | | s | >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 | 40  (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 15  (NOTE 1) | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| Note 1: If the test is performed in a NGSO configuration, and the scaling factor Kmulti\_SMTC defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of times T2 and T3 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case.  Note 2: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | |

14.1.1.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.1.1.4.1-3. 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 *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2 and T3.

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. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.1.5-1. T2 starts.

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 34 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 66 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, 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 1.

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 14.1.1.5-1. T3 starts.

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 8 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 14.5 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, 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 to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a.The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 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.

14.1.1.4.3 Message contents

FFS

14.1.1.5 Test requirements

Table 14.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell reselection for Satellite Access.

Table 14.1.1.5-1: Cell specific parameters for NR SA FR1 Cell reselection for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | | NSC.1 for Config 1  NSC.2 for Config 2 | | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET configuration |  | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET configuration |  | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern |  | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | | ULBWP.0.1 | | |
| SSB configuration |  | SSB.1 FR1 | | | SSB.5 FR1 | | |
| SMTC configuration |  | SMTC.1 for Cell 1 | | | SMTC.4 for Cell 2 | | |
| RLM-RS |  | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | -130 | | | -130 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| Qhysts | dB | 0 | | | 0 | | |
| Qoffsets, n | dB | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | | SS-RSRP | | |
|  | dB | 16+TT | -3.11+TT | 2.79+TT | -infinity | 2.79+TT | -3.11+TT |
| Note2 | dBm/SCS | -98+TT | | | | | |
| Note2 | dBm/15 kHz | -98+TT | | | | | |
|  | dB | 16+TT | 13+TT | 16+TT | -infinity | 16+TT | 13+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -82+TT | -infinity | -82+TT | -85+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT |
| SintrasearchP | dB | 60 | | | 60 | | |
| Propagation Condition |  | AWGN | | | | | |

The cell reselection 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

34 s if Kmulti\_SMTC is equal to 1 (see note on Table 14.1.1.4.1-3); or

66 s if Kmulti\_SMTC is equal to 2.

The cell reselection 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to an already detected cell shall be less than:

8 s if Kmulti\_SMTC is equal to 1 (see note on Table 14.1.1.4.1-3); or

14.5 s if Kmulti\_SMTC is equal to 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Kmulti\_SMTC \*Tdetect, NR\_Intra + TSI-NR, and to an already detected cell can be expressed as: Kmulti\_SMTC \*Tevaluate, NR\_ intra + TSI-NR,

Where:

Tdetect, NR\_Intra See Table 14.1.0.1-1 in clause 14.1.0.1

Tevaluate, NR\_ intra See Table 14.1.0.1-1 in clause 14.1.0.1

Kmulti\_SMTC is described in clause 14.1.0.1

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If Kmulti\_SMTC = 1, Kmulti\_SMTC \*Tevaluate, NR\_Intra + TSI-NR = 7.68 s; allow 8 s. And Kmulti\_SMTC \*Tdetect, NR\_ intra + TSI-NR = 33.28 s, allow 34s.

If K\_multi\_SMTC = 2, Kmulti\_SMTC \*Tevaluate, NR\_Intra + TSI-NR = 14.08 s; allow 14.5 s. And Kmulti\_SMTC \*Tdetect, NR\_ intra + TSI-NR = 65.28 s, allow 66s.

### 14.1.2 NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Call setup and test procedure needs to be updated
* Applicability needs to be updated
* Exceptions to connection diagram may need to be updated
* Several sections are in brackets
* Several test parameters and configuration are still in brackets
* Annex E and F need to be updated

14.1.2.1 Test purpose

This test is to verify the requirement for the intra frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

14.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access [and enhanced RRM measurement requirements for NTN bands].

14.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.2.

14.1.2.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.2.4.1-1, 14.1.2.4.1-3 and 14.1.2.5-1. The test consists of three 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. The flag *enhancedMeasurementLEO-r17* should be set.

14.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.2.4.1-1.

Table 14.1.2.4.1-1: Supported test configurations for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.2.4.1-2

Table 14.1.2.4.1-2: Initial conditions for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.1.2.4.1-3.

2. Message contents are defined in clause 14.1.2.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Both Cell 1 and Cell 2 are satellite access cells].

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.2.4.1-3: General test parameters for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | Cell1 |  |
| T2 end condition | Active cell |  | Cell2 |  |
|  | Neighbour cells |  | Cell1 |  |
| Final condition | Active cell |  | Cell1 |  |
|  | Neighbour cells |  | Cell2 |  |
| RF Channel Number | |  | 1 |  |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | Not configured |  |
| T1 | | s | >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 | 40  (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 15  (NOTE 1) | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| NOTE 1: If the test is performed in a NGSO configuration, and the scaling factor Kmulti\_SMTC defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of times T2 and T3 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case. | | | | |

14.1.2.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.1.2.4.1-3. 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.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2 and T3.

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]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.2.5-1. T2 starts.

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 11 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 20 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, 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 11a.

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 14.1.2.5-1. T3 starts.

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 6 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 9 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, 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 to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a.The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 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.

14.1.2.4.3 Message contents

FFS

14.1.2.5 Test requirements

Table 14.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access.

Table 14.1.2.5-1: Cell specific parameters for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | | NSC.1 for Config 1  NSC.2 for Config 2 | | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET configuration |  | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET configuration |  | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern |  | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | | ULBWP.0.1 | | |
| SSB configuration |  | SSB.1 FR1 | | | SSB.X FR1 | | |
| SMTC configuration |  | #1: SMTC.2 for Cell 1  #2: SMTC.7 for Cell 2 | | | #1: SMTC.2 for Cell 1  #2: SMTC.7 for Cell 2 | | |
| RLM-RS |  | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | -130 | | | -130 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| Qhysts | dB | 0 | | | 0 | | |
| Qoffsets, n | dB | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | | SS-RSRP | | |
|  | dB | 16+TT | -3.11+TT | 2.79+TT | -infinity | 2.79+TT | -3.11+TT |
| Note2 | dBm/SCS | -98+TT | | | | | |
| Note2 | dBm/15 kHz | -98+TT | | | | | |
|  | dB | 16+TT | 13+TT | 16+TT | -infinity | 16+TT | 13+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -82+TT | -infinity | -82+TT | -85+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT |
| SintrasearchP | dB | 60 | | | 60 | | |
| Propagation Condition |  | AWGN | | | | | |

The cell reselection 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 *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

11 s if Kmulti\_SMTC is equal to 1 (see note on Table 14.1.2.4.1-3); or

20 s if Kmulti\_SMTC is equal to 2.

The cell reselection 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 *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than:

6 s if Kmulti\_SMTC is equal to 1 (see note on Table 14.1.2.4.1-3); or

9 s if Kmulti\_SMTC is equal to 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Kmulti\_SMTC \*Tdetect, NR\_Intra\_enh + TSI-NR, and to an already detected cell can be expressed as: Kmulti\_SMTC \*Tevaluate, NR\_ intra\_enh + TSI-NR,

Where:

Tdetect, NR\_Intra\_enh See Table 14.1.0.1-2 in clause 14.1.0.1

Tevaluate, NR\_ Intra\_enh See Table 14.1.0.1-2 in clause 14.1.0.1

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If Kmulti\_SMTC = 1, Kmulti\_SMTC \*Tevaluate, NR\_Intra\_enh + TSI-NR = 5.12 s; allow 6 s. And Kmulti\_SMTC \*Tdetect, NR\_ Intra\_enh + TSI-NR = 10.24 s, allow 11 s.

If K\_multi\_SMTC = 2, Kmulti\_SMTC \*Tevaluate, NR\_Intra\_enh + TSI-NR = 8.96 s; allow 9 s. And Kmulti\_SMTC \*Tdetect, NR\_Intra\_enh + TSI-NR = 19.2 s, allow 20s.

In this test, SMTC.2 (period 20ms, duration 5ms, offset 0ms) and SMTC.7 (period 20ms, duration 5ms, offset 5ms) are configured. These are non-overlapping SMTCs therefore, according to clause 14.1.0.1, Kmulti\_SMTC = 1 for GEO, Kmulti\_SMTC = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC , and Kmulti\_SMTC = 2 for LEO for Ues supporting measurement of two or more LEO satellites in parallel within an SMTC .

### 14.1.3 NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

Editor’s Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Call setup and test procedure needs to be updated
* Applicability needs to be updated
* Exceptions to connection diagram may need to be updated
* Several sections are in brackets
* Several test parameters and configuration are still in brackets
* Annex E and F need to be updated

14.1.3.1 Test purpose

This test is to verify the requirement for the intra frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

14.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access [and time-based measurement initiation].

14.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.3.

14.1.3.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.3.4.1-1, 14.1.3.4.1-3 and 14.1.3.5-1. The test consists of two successive time periods, with time duration of T1 and T2, 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. *T-Service* broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2.

14.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.3.4.1-1.

Table 14.1.3.4.1-1: Supported test configurations for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.3.4.1-2

Table 14.1.3.4.1-2: Initial conditions for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | [For 4Rx capable Ues without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.1.3.4.1-3.

2. Message contents are defined in clause 14.1.3.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Both Cell 1 and Cell 2 are satellite access cells].

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.3.4.1-3: General test parameters for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | Cell1 |  |
| T2 end condition | Active cell |  | Cell2 |  |
| Neighbour cells |  | Cell1 |  |
| RF Channel Number | |  | 1 |  |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | Not configured |  |
| T1 | | s | >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 | 40  (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| NOTE 1: If the test is performed in a NGSO configuration, and the scaling factor Kmulti\_SMTC defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of time T2 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case. | | | | |

14.1.3.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

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]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. *T-Service* broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2, according to Table 14.1.3.4.3-FFS (this timestamp indicates the UE when Cell 1 will stop providing service). T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.3.5-1. T2 starts.

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 34 seconds for GSO configurations or for NGSO configurations for Ues supporting measurement of only one LEO satellite in parallel within an SMTC, or within 66 seconds for NGSO configurations for Ues supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

7. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 7a.

7a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

8. Repeat step 2-7 until a test verdict has been achieved.

14.1.3.4.3 Message contents

FFS

14.1.3.5 Test requirements

Table 14.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access.

Table 14.1.3.5-1: Cell specific parameters for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | NSC.1 for Config 1t  NSC.2 for Config 2 | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration |  | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration |  | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern |  | OP.1 | | OP.1 | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration |  | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration |  | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS |  | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| Qhysts | dB | 0 | | 0 | |
| Qoffsets, n | dB | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | SS-RSRP | |
|  | dB | 16+TT | -3.11+TT | -infinity | 2.79+TT |
| Note2 | dBm/SCS | -98+TT | | | |
| Note2 | dBm/15 kHz | -98+TT | | | |
|  | dB | 16+TT | 13+TT | -infinity | 16+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -infinity | -82+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | |
| Treselection | s | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 40 | | 40 | |
| Propagation Condition |  | AWGN | | | |

The cell reselection 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

34 s if Kmulti\_SMTC is equal to 1 (see note on Table 14.1.3.4.1-3); or

66 s if Kmulti\_SMTC is equal to 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Kmulti\_SMTC \*Tdetect, NR\_Intra + TSI-NR,

Where:

Tdetect, NR\_Intra See Table 14.1.0.1-1 in clause 14.1.0.1

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If Kmulti\_SMTC = 1, Kmulti\_SMTC \*Tdetect, NR\_ intra + TSI-NR = 33.28 s, allow 34s.

If Kmulti\_SMTC = 2, Kmulti\_SMTC \*Tdetect, NR\_ intra + TSI-NR = 65.28 s, allow 66s.

In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.1, Kmulti\_SMTC = 1 for GEO, Kmulti\_SMTC = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC , and Kmulti\_SMTC = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC .

### 14.1.4 NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

Editor’s Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Call setup and test procedure needs to be updated
* Applicability needs to be updated
* Exceptions to connection diagram may need to be updated
* Several sections are in brackets
* Several test parameters and configuration are still in brackets
* Annex E and F need to be updated

14.1.4.1 Test purpose

This test is to verify the requirement for the intra frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

14.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access [and location-based measurement initiation].

14.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.4.

14.1.4.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.4.4.1-1, 14.1.4.4.1-3 and 14.1.4.5-1. The test consists of two successive time periods, with time duration of T1 and T2, 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.

At 4s after the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m.

14.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.4.4.1-1.

Table 14.1.4.4.1-1: Supported test configurations for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.4.4.1-2

Table 14.1.4.4.1-2: Initial conditions for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | [For 4Rx capable Ues without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.1.4.4.1-3.

2. Message contents are defined in clause 14.1.4.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Both Cell 1 and Cell 2 are satellite access cells].

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.4.4.1-3: General test parameters for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | Cell1 |  |
| T2 end condition | Active cell |  | Cell2 |  |
| Neighbour cells |  | Cell1 |  |
| RF Channel Number | |  | 1 |  |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | Not configured |  |
| T1 | | s | >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 | 40  (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| NOTE 1: If the test is performed in a NGSO configuration, and the scaling factor Kmulti\_SMTC defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of time T2 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case. | | | | |

14.1.4.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

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]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.4.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.4.5-1. T2 starts.

5. After 4 seconds from the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m, according to Table 14.1.4.4.3-FFS.

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

7. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds for GSO configurations or for NGSO configurations for Ues supporting measurement of only one LEO satellite in parallel within an SMTC, or within 66 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat step 2-8 until a test verdict has been achieved.

14.1.4.4.3 Message contents

FFS

14.1.4.5 Test requirements

Table 14.1.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access.

Table 14.1.4.5-1: Cell specific parameters for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | NSC.1 for Config 1  NSC.2 for Config 2 | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration |  | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration |  | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern |  | OP.1 | | OP.1 | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration |  | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration |  | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS |  | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| Qhysts | dB | 0 | | 0 | |
| Qoffsets, n | dB | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | SS-RSRP | |
|  | dB | 16+TT | -3.11+TT | -infinity | 2.79+TT |
| Note2 | dBm/SCS | -98+TT | | | |
| Note2 | dBm/15 kHz | -98+TT | | | |
|  | dB | 16+TT | 13+TT | -infinity | 16+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -infinity | -82+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | |
| Treselection | s | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 40 | | 40 | |
| Propagation Condition |  | AWGN | | | |

The cell reselection 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

34 s if Kmulti\_SMTC is equal to 1 (see note on Table 14.1.4.4.1-3); or

66 s if Kmulti\_SMTC is equal to 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Kmulti\_SMTC \*Tdetect, NR\_Intra + TSI-NR, and to an already detected cell can be expressed as: Kmulti\_SMTC \*Tevaluate, NR\_ intra + TSI-NR,

Where:

Tdetect, NR\_Intra See Table 14.1.0.1-1 in clause 14.1.0.1

Tevaluate, NR\_ intra See Table 14.1.0.1-1 in clause 14.1.0.1

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If Kmulti\_SMTC = 1, Kmulti\_SMTC \*Tdetect, NR\_ intra + TSI-NR = 33.28 s, allow 34s.

If Kmulti\_SMTC = 2, Kmulti\_SMTC \*Tdetect, NR\_ intra + TSI-NR = 65.28 s, allow 66s.

In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.1, Kmulti\_SMTC = 1 for GEO, Kmulti\_SMTC = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC , and Kmulti\_SMTC = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC .

### 14.1.5 NR SA FR1-FR1 Cell Reselection for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS

- Several test parameters and configuration are still in brackets

14.1.5.1 Test purpose

This test is to verify the requirement for the inter frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

14.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.5.

14.1.5.4 Test description

The test scenario comprises of 2 NR carriers and 2 cells as given in tables 14.1.5.4.1-1, 14.1.5.4.1-3 and 14.1.5.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

14.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.5.4.1-1.

Table 14.1.5.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.5-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.5-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.5.4.1-2

Table 14.1.5.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.1.5.4.1-3.

2. Message contents are defined in clause 14.1.5.4.3.

3. Cell 1 and Cell 2 are NR cells on two different carriers with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.5.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | 1, 2 | Cell 1 |  |
| T2 end condition | Active cell |  | 1, 2 | Cell 2 |  |
|  | Neighbour cells |  | 1, 2 | Cell 1 |  |
| Final condition | Active cell |  | 1, 2 | Cell 1 |  |
|  | Neighbour cells |  | 1, 2 | Cell 2 |  |
| RF Channel Number | |  | 1, 2 | 1,2 |  |
| Time offset between cells | | ms | 1, 2 | 3 | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1, 2 | SSB.1 FR1 |  |
| SMTC configuration#1 | |  | 1, 2 | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
| SMTC configuration#2 | |  | 1, 2 | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| Ephemeris information | |  | 1, 2 | Note 1 |  |
| 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 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | | |

14.1.5.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.1.5.4.1-3. 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 *RRCSetupRequest* message to perform a registration procedure for mobility”.

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. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.5.5-1. T2 starts.

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 68 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC] 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 1.

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 14.1.5.5-1. T3 starts.

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 8 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC], 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 to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a.The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 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.

14.1.5.4.3 Message contents

FFS

14.1.5.5 Test requirements

Table 14.1.5.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell reselection for Satellite Access.

Table 14.1.5.5-1: Cell specific parameters for NR SA FR1-FR1 Cell reselection for Satellite Access

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information |  | 1 | SSC.1 | | | SSC.1 | | |
| 2 | SSC.2 | | | SSC.2 | | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| 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, 2 | -130 | | | -130 | | |
| 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 | | |
|  | dB | 1, 2 | 16+TT | -3.11+TT | 2.79+TT | -infinity | 2.79+TT | -3.11+TT |
| Note2 | dBm/SCS | 1, 2 | -98+TT | | | | | |
| Note2 | dBm/15 kHz | 1, 2 | -98+TT | | | | | |
|  | dB | 1, 2 | 16+TT | 13+TT | 16+TT | -infinity | 16+TT | 13+TT |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -82+TT | -85+TT | -82+TT | -infinity | -82+TT | -85+TT |
| Io | dBm/9.36 MHz | 1, 2 | -53.94+TT | -52.21+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 1, 2 | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT |
| SintersearchP | dB | 1, 2 | 60 | | | 60 | | |
| 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. | | | | | | | | |

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period [T2], to the moment when the UE camps again on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: Thigher\_priority\_search + Tevaluate, NR\_ inter + TSI-NR, and to a lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Thigher\_priority\_search See clause 4.2.2.7 in TS 38.133 [6].

Tevaluate, NR\_ inter See Table 14.1.0.2-1 in clause 14.1.0.2

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 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell.

### 14.1.6 NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS

- Several test parameters and configuration are still in brackets

14.1.6.1 Test purpose

This test is to verify the requirement for the intra frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

14.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and enhanced RRM idle mode measurements in NTN bands.

14.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.6.

14.1.6.4 Test description

The test scenario comprises of 2 NR carriers and 2 cells as given in tables 14.1.6.4.1-1, 14.1.6.4.1-3 and 14.1.6.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

14.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.6.4.1-1.

Table 14.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.6.4.1-2

Table 14.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.1.6.4.1-3.

2. Message contents are defined in clause 14.1.6.4.3.

3. Cell 1 and Cell 2 are NR cells on two different carriers with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.6.4.1-3: General test parameters for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | Cell 1 |  |
| T2 end condition | Active cell |  | Cell 2 |  |
|  | Neighbour cells |  | Cell 1 |  |
| Final condition | Active cell |  | Cell 1 |  |
|  | Neighbour cells |  | Cell 2 |  |
| RF Channel Number | |  | 1,2 |  |
| Time offset between cells | | ms | 3 | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | SSB.1 FR1 |  |
| SMTC configuration#1 | |  | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
| SMTC configuration#2 | |  | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | Not configured |  |
| Ephemeris information | |  | Note 1 |  |
| T1 | | s | >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 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | |

14.1.6.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.1.2.4.1-3. 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. The flag *enhancedMeasurementNGSO-r17* should be set.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

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. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.6.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.6.5-1. T2 starts.

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 [FFS seconds] for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC], 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 1.

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 14.1.6.5-1. T3 starts.

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 3 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC], 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 to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a.The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 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.

14.1.6.4.3 Message contents

FFS

14.1.6.5 Test requirements

Table 14.1.6.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access.

Table 14.1.6.5-1: Cell specific parameters for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | | SSC.1 for Config 1  SSC.2 for Config 2 | | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration |  | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration |  | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern |  | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | -130 | | | -130 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| Qhysts | dB | 0 | | | 0 | | |
| Qoffsets, n | dB | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | | SS-RSRP | | |
|  | dB | 16+TT | -3.11+TT | 2.79+TT | -infinity | 2.79+TT | -3.11+TT |
| Note2 | dBm/SCS | -98+TT | | | | | |
| Note2 | dBm/15 kHz | -98+TT | | | | | |
|  | dB | 16+TT | 13+TT | 16+TT | -infinity | 16+TT | 13+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -82+TT | -infinity | -82+TT | -85+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT |
| SintersearchP | dB | 60 | | | 60 | | |
| Propagation Condition |  | AWGN | | | | | |

The cell reselection delay to a lower priority 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Tevaluate, NR\_ inter See Table 14.1.0.2-2 in clause 14.1.0.2

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.

### 14.1.7 NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

Editor’s Note:

- MU and TT analysis is incomplete

- Message contents are FFS

- Call setup and test procedure needs to be updated

- Several test parameters and configuration are still in brackets

- Annex E and F need to be updated

14.1.7.1 Test purpose

This test is to verify the requirement for the inter frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

14.1.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and time-based measurement initiation.

14.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.7.

14.1.7.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.7.4.1-1, 14.1.7.4.1-3 and 14.1.7.5-1. The test consists of two successive time periods, with time duration of T1 and T2 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. t-Service broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2.

14.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.7.4.1-1.

Table 14.1.7.4.1-1: Supported test configurations for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.7-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.7-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.7.4.1-2

Table 14.1.7.4.1-2: Initial conditions for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.1.7.4.1-3.

2. Message contents are defined in clause 14.1.7.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.7.4.1-3: General test parameters for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1, 2 | 3 ms | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] 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 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

14.1.7.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

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]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.7.5-1. Propagation conditions are set according to Annex C clause C.2.2. *T-Service* broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2, according to Table 14.1.7.4.3-FFS (this timestamp indicates the UE when Cell 1 will stop providing service). T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.7.5-1. T2 starts.

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 [36] seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

7. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 7a.

7a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

8. Repeat step 2-7 until a test verdict has been achieved.

14.1.7.4.3 Message contents

FFS

14.1.7.5 Test requirements

Table 14.1.7.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access.

Table 14.1.7.5-1: Cell specific parameters for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | NSC.1 for Config 1  NSC.2 for Config 2 | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration |  | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration |  | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern |  | OP.1 | | OP.1 | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration |  | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration |  | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS |  | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| Qhysts | dB | 0 | | 0 | |
| Qoffsets, n | dB | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | SS-RSRP | |
|  | dB | 16+TT | -3.11+TT | -infinity | 2.79+TT |
| Note2 | dBm/SCS | -98+TT | | | |
| Note2 | dBm/15 kHz | -98+TT | | | |
|  | dB | 16+TT | 13+TT | -infinity | 16+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -infinity | -82+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | |
| Treselection | s | 0 | 0 | 0 | 0 |
| SintersearchP | dB | 40+TT | | 40+TT | |
| Propagation Condition |  | AWGN | | | |

The cell reselection delay to a lower priority 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than [36] s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Tevaluate, NR\_ inter See Table 4.2C.2.4-1 in TS 38.133 [6] clause 4.2C.2.4

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 80ms period.

[In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.2, Kmulti\_SMTC = 1 for GEO, Kmulti\_SMTC = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC , and Kmulti\_SMTC = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC .]

### 14.1.8 NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

Editor’s Note:

- MU and TT analysis is incomplete

- Message contents are FFS

- Call setup and test procedure needs to be updated

- Several test parameters and configuration are still in brackets

- Annex E and F need to be updated

14.1.8.1 Test purpose

This test is to verify the requirement for the inter frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

14.1.8.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and location-based measurement initiation.

14.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.8.

14.1.8.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.8.4.1-1, 14.1.8.4.1-3 and 14.1.8.5-1. The test consists of two successive time periods, with time duration of T1and T2, 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.

At 4s after the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m.

14.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.8.4.1-1.

Table 14.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.8-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.8-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.8.4.1-2

Table 14.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.1.8.4.1-3.

2. Message contents are defined in clause 14.1.8.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1, 2 | 3 ms | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] 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 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

14.1.8.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

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]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.8.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this 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 14.1.8.5-1. T2 starts.

5. After 4 seconds from the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m, according to Table 14.1.8.4.3-FFS.

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

7. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within [36] seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat step 2-8 until a test verdict has been achieved.

14.1.8.4.3 Message contents

FFS

14.1.8.5 Test requirements

Table 14.1.8.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access.

Table 14.1.8.5-1: Cell specific parameters for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | SSC.1 for Config 1  SSC.2 for Config 2 | | NSC.1 for Config 1  NSC.2 for Config 2 | |
| PDSCH RMC configuration |  | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration |  | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration |  | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern |  | OP.1 | | OP.1 | |
| Initial DL BWP configuration |  | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration |  | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration |  | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS |  | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| Qhysts | dB | 0 | | 0 | |
| Qoffsets, n | dB | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | SS-RSRP | | SS-RSRP | |
|  | dB | 16+TT | -3.11+TT | -infinity | 2.79+TT |
| Note2 | dBm/SCS | -98+TT | | | |
| Note2 | dBm/15 kHz | -98+TT | | | |
|  | dB | 16+TT | 13+TT | -infinity | 16+TT |
| SS-RSRP Note3 | dBm/SCS | -82+TT | -85+TT | -infinity | -82+TT |
| Io | dBm/9.36 MHz | -53.94+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | |
| Treselection | s | 0 | 0 | 0 | 0 |
| SintersearchP | dB | 40+TT | | 40+TT | |
| Propagation Condition |  | AWGN | | | |

The cell reselection delay to a lower priority 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than [36] s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Tevaluate, NR\_ inter See Table 4.2C.2.4-1 in TS 38.133 [6] clause 4.2C.2.4

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 80ms period.

[In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.1, Kmulti\_SMTC = 1 for GEO, Kmulti\_SMTC = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC , and Kmulti\_SMTC = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC .]

### 14.1.9 NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access

14.1.9.1 Test purpose

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 7.1.1.0.4, for UE fulfilling low mobility relaxed measurement criterion.

14.1.9.2 Test applicability

This test applies to all types of NR UE release 17 and forward satellite access and relaxed RRM idle mode measurements in NTN bands.

14.1.9.3 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.14.1.9.

14.1.9.4 Test description

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables 14.1.9.4.1-1, 14.1.9.4.1-3 and 14.1.9.5-1. The test consists of two successive time periods, with time duration of T1 and T2 respectively

14.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.9.4.1-1.

Table 14.1.9.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.9-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.9-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.9.4.1-2

Table 14.1.9.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.1.9.4.1-3.

2. Message contents are defined in clause 14.1.9.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.9.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell 2 | The UE camps on Cell 2 in the initial phase, it fulfills Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to Cell 1 |
| Neighbour cells |  | 1, 2 | Cell 1 |
| T1 end condition | Active cell |  | 1, 2 | Cell 1 | The UE shall perform reselection to Cell 1 during T1 |
| Neighbour cells |  | 1, 2 | Cell 2 |
| T2 end condition | Active cell |  | 1, 2 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T2 |
| Neighbour cells |  | 1, 2 | Cell 1 |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | | ms | 1, 2 | 3 | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | |  | 1, 2 | SSB.1 FR1 |  |
| SMTCconfiguration | |  | 1, 2 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
| SMTC pattern 6 | Configured in SIB4 of Cell 2 |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| Ephemeris information | |  |  | Note 1 |  |
| T1 | | s | 1, 2 | 25 | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | 25 | T2 is defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | | |

14.1.9.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells on two different NR carriers as given in table 14.1.9.4.1-3. 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.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

The UE is configured with the relaxed measurement criterion for UE with low mobility defined in TS 38.304 [30] clause 5.2.4.9.1. So, Cell 2 and Cell 1 configure the UE as follows:

*lowMobilityEvalutation* [13] criterion is configured according to the parameters listed in Table 14.1.9.5-1;

*cellEdgeEvaluation* [13] criterion is not configured;

*combineRelaxedMeasCondition* [13] is not configured;

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. Cell 2 is the active cell and Cell 1 is the neighbor cell.

1a. Set the parameters according to T2 in Table 14.1.9.5-1. SS waits at least for 32sec (Tdetect,NR\_Inter) to ensure the UE can detect NR neighbor cell (Cell 1).

2. Set the parameters according to T1 in Table 14.1.9.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. If the UE responds on Cell 1 during time duration T1 within 17 seconds, from the beginning of time period T1, then count a success for the test.

4. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 4a.  
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 1.

4a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

5. The SS shall switch the power setting from T1 to T2 as specified in Table 14.1.9.5-1. T2 starts.

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

7. If the UE responds on Cell 2 during time duration T2 within 17 seconds, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat step 1a-8 until a test verdict has been achieved. Each of the events “Re-select already detected lower priority Cell 1” and “Re-select already detected 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.

14.1.9.4.3 Message contents

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

Table 14.1.9.4.3-1: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| servingCellConfigCommon SEQUENCE { | |  |  |  |
| downlinkConfigCommon SEQUENCE { | |  |  |  |
| pcch-Config SEQUENCE { | |  |  |  |
| defaultPagingCycle | | rf64 |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 14.1.9.4.3-2: SIB2 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | Not present |  |  |
| threshServingLowP | 22 | Actual value = 22\*2 = 44dB |  |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB3 |  |  |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.1.9.4.3-3: SIB2 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | Not present |  |  |
| threshServingLowP | 23 | Actual value = 23\*2 = 46dB |  |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB15 |  |  |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.1.9.4.3-4: SIB4 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | entry 1 |  |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 |  |  |
| deriveSSB-IndexFromCell | false |  |  |
| threshX-HighP | 22 | Actual value = 22\*2 = 44dB |  |
| threshX-LowP | 25 | Actual value = 25\*2 = 50dB |  |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.1.9.4.3-5: SIB4 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | entry 1 |  |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 |  |  |
| deriveSSB-IndexFromCell | false |  |  |
| threshX-HighP | 24 | Actual value = 24\*2 = 48dB |  |
| threshX-LowP | 24 | Actual value = 24\*2 = 48dB |  |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.1.9.5 Test requirements

Table 14.1.9.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access.

Table 14.1.9.5-1: Cell specific parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | |
|  |  |  | T1 | T2 | T1 | | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | | |
| 2 | SSC.2 | | NSC.2 | | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | CCR.1.1 FDD | | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.2.1 | | OP.1 defined in A.2.1 | | |
| 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, 2 | -140 | | -140 | | |
| 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 | | |
|  | dB | 1, 2 | 14 | 14 | -3.70 | 9.75 | |
| Note2 | dBm/SCS | 1, 2 | -98 | | | | |
| Note2 | dBm/15 kHz | 1, 2 | -98 | | | | |
|  | dB | 1, 2 | 14 | 14 | -3.70 | | 9.75 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -84 | -84 | -101.70 | | -88.25 |
| Io | dBm/9.36 MHz | 1, 2 | -55.88 | -55.88 | -68.51 | | -59.86 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | | 0 |
| SnonintersearchP | dB | 1, 2 | Not sent | | Not sent | | |
| Threshx, highP | dB | 1, 2 | 48 | | 44 | | |
| Threshserving, lowP | dB | 1, 2 | 44 | | 46 | | |
| Threshx, lowP | dB | 1, 2 | 48 | | 50 | | |
| SSearchDeltaP | dB | 1, 2 | 3 | | 3 | | |
| TSearchDeltaP | s | 1, 2 | 5 | | 5 | | |
| 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. | | | | | | | |

The cell reselection delay to an already detected lower priority cell for UE fulfilling low mobility relaxed measurements 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 a lower priority cell for UE fulfilling low mobility relaxed measurements shall be less than 17s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling low mobility relaxed measurements 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 higher priority cell for UE fulfilling low mobility relaxed measurements shall be less than 17s.

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

NOTE: The cell re-selection delay to a known lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Tevaluate, NR\_ inter See Table 4.2.2.10.2-1 in TS 38.133 [6] 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 16.64s, allow 17s for the cell re-selection delay to an already detected lower priority cell and 16.64s for the cell re-selection delay to an already detected higher priority cell, which we allow 17s for UE fulfilling low mobility relaxed measurements in the test case.

### 14.1.10 NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access

14.1.10.1 Test purpose

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 7.1.1.0.4, for UE fulfilling low mobility relaxed measurement criterion.

14.1.10.2 Test applicability

This test applies to all types of NR UE release 17 and forward satellite access and relaxed RRM idle mode measurements in NTN bands.

14.1.10.3 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.14.1.10.

14.1.10.4 Test description

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables 14.1.10.4.1-1, 14.1.10.4.1-3 and 14.1.10.5-1. The test consists of two successive time periods, with time duration of T1 and T2 respectively

14.1.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.10.4.1-1.

Table 14.1.10.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.1.10-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.10-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.1.10.4.1-2

Table 14.1.10.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.10.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.1.10.4.1-3.

2. Message contents are defined in clause 14.1.10.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.1.10.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell 2 | The UE camps on Cell 2 in the initial phase, it fulfills Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to Cell 1 |
| Neighbour cells |  | 1, 2 | Cell 1 |
| T1 end condition | Active cell |  | 1, 2 | Cell 1 | The UE shall perform reselection to Cell 1 during T1 |
| Neighbour cells |  | 1, 2 | Cell 2 |
| T2 end condition | Active cell |  | 1, 2 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T2 |
| Neighbour cells |  | 1, 2 | Cell 1 |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | | ms | 1, 2 | 3 | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | |  | 1, 2 | SSB.1 FR1 |  |
| SMTCconfiguration | |  | 1, 2 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
| SMTC pattern 6 | Configured in SIB4 of Cell 2 |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| Ephemeris information | |  |  | Note 1 |  |
| T1 | | s | 1, 2 | 20 | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | 20 | T2 is defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | | |

14.1.10.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells on two different NR carriers as given in table 14.1.10.4.1-3. 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.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

The UE is configured with the relaxed measurement criterion for UE not-at-cell edge as defined in TS 38.304 [30] clause 5.2.4.9.2 in [30]. So, Cell 2 and Cell 1configures the UE as follows:

*cellEdgeEvaluation* [13] criterion is configured according to the parameters listed in Table 14.1.9.2-3;

*lowMobilityEvalutation* [13] criterion is not configured;

*combineRelaxedMeasCondition* [13] is not configured;

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. Cell 2 is the active cell and Cell 1 is the neighbor cell.

1a. Set the parameters according to T2 in Table 14.1.10.5-1. SS waits at least for 32sec (Tdetect,NR\_Inter) to ensure the UE can detect NR neighbor cell (Cell 1).

2. Set the parameters according to T1 in Table 14.1.10.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. If the UE responds on Cell 1 during time duration T1, within 17 seconds from the beginning of time period T1, then count a success for the test.

4. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 4a.  
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 1.

4a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

5. The SS shall switch the power setting from T1 to T2 as specified in Table 14.1.10.5-1. T2 starts.

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

7. If the UE responds on Cell 2 during time duration T2 within 17 seconds, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat steps 1a-8 until a test verdict has been achieved. Each of the events “Re-select already detected lower priority Cell 1” and “Re-select already detected 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.

14.1.10.4.3 Message contents

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

Table 14.1.10.4.3-1: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| servingCellConfigCommon SEQUENCE { | |  |  |  |
| downlinkConfigCommon SEQUENCE { | |  |  |  |
| pcch-Config SEQUENCE { | |  |  |  |
| defaultPagingCycle | | rf64 |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 14.1.10.4.3-2: SIB2 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | Not present |  |  |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 | Not present |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { | Not present |  |  |
| s-SearchThresholdP-r16 | 25 | Actual value = 25\*2 = 50dB |  |
| s-SearchThresholdQ-r16 | Not present |  |  |
| } |  |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.1.10.4.3-3: SIB2 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | Not present |  |  |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 | Not present |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { | Not present |  |  |
| s-SearchThresholdP-r16 | 17 | Actual value = 17\*2 = 34dB |  |
| s-SearchThresholdQ-r16 | Not present |  |  |
| } |  |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.1.10.4.3-4: SIB4 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | entry 1 |  |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 SSB |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 |  |  |
| deriveSSB-IndexFromCell | false |  |  |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.1.10.4.3-5: SIB4 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry |  |  |
| InterFreqCarrierFreqInfo[1] SEQUENCE { |  | entry 1 |  |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 |  |  |
| deriveSSB-IndexFromCell | false |  |  |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.1.10.5 Test requirements

Table 14.1.10.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access.

Table 14.1.10.5-1: Cell specific parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | |
| T1 | T2 | T1 | | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | | |
| 2 | SSC.2 | | NSC.2 | | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | CCR.1.1 FDD | | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.2.1 | | OP.1 defined in A.2.1 | | |
| 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, 2 | -140 | | -140 | | |
| 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 | | |
|  | dB | 1, 2 | 16 | 14 | -3.65 | 16 | |
| Note2 | dBm/SCS | 1, 2 | -98 | -98 | -100 | -100 | |
| Note2 | dBm/15 kHz | 1, 2 | -98 | -98 | -100 | -100 | |
|  | dB | 1, 2 | 16 | 14 | -3.65 | | 16 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -82 | -84 | -103.65 | | -84 |
| Io | dBm/9.36 MHz | 1, 2 | -53.94 | -55.88 | -70.49 | | -55.94 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | | 0 |
| SnonintersearchP | dB | 1, 2 | Not sent | | Not sent | | |
| Threshx, highP | dB | 1, 2 | 48 | | 48 | | |
| Threshserving, lowP | dB | 1, 2 | 44 | | 44 | | |
| Threshx, lowP | dB | 1, 2 | 50 | | 50 | | |
| SSearchThresholdP | dB | 1, 2 | 50 | | 34 | | |
| SSearchThresholdQ | s | 1, 2 | Not Configured | | | | |
| 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. | | | | | | | |

The cell reselection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge relaxed measurements 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 lower priority cell for UE fulfilling not-at-cell edge relaxed measurements shall be less than 17s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling not-at-cell-edge relaxed measurements 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 higher priority cell for UE fulfilling not-at-cell-edge relaxed measurements shall be less than 17s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Tevaluate, NR\_ inter See Table 4.2.2.10.3-1 in TS 38.133 [6] clause 4.2.2.10

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 16.64s, allow 17s for the cell re-selection delay to an already detected lower priority cell and 16.64s for the cell re-selection delay to an already higher priority cell, which we allow 17s for UE fulfilling not-at-cell edge relaxed measurements in the test case.

## 14.2 RRC\_CONNECTED state mobility

### 14.2.1 Handover for SAN

#### 14.2.1.0 Minimum conformance requirements

##### 14.2.1.0.1 Minimum conformance requirements for handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR SAN FR1 cell to NR SAN FR1 cell. The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, Koffset, and Kmac for target NR SAN cell during Dhandover, otherwise interruption time may be longer than the requirements in this clause.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.1.2.

14.2.1.0.1.1 Handover delay

When the UE receives a RRC message implying handover to NR SAN cell, the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover msec from the end of the last TTI containing the RRC command.

Where:

- Dhandover equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 14.2.1.0.1.2.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.1.2.1

14.2.1.0.1.2 Interruption time

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 to NR SAN cell is commanded,

the interruption time shall be less than Tinterrupt

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

Otherwise, no interruption time requirement is applied.

Where:

- Tsearch is the time required to search the target NR SAN cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then Tsearch = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot ≥ -2 dB, then Tsearch = Trs ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot ≥ -2 dB, then Tsearch = 3\* Trs ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

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

- 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.

- 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 SAN 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 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 the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 38.133 [6] clause 9.2.5 for intra-frequency handover and TS 38.133 [6] clause 9.3.4 for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.1.2.2

##### 14.2.1.0.2 Minimum conformance requirements for conditional handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency conditional handover from NR SAN FR1 cell to NR SAN FR1 cell. The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, Koffset, and Kmac for target NR SAN cell during DCHO, otherwise the measurement time, preparation time and interruption time may be longer than the requirements in clauses 14.2.1.0.2.2, 14.2.1.0.2.3 and 14.2.1.0.2.4.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.

14.2.1.0.2.1 Handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13]. UE shall start RRM measurement before the time or distance condition is met, the time/distance condition is defined in clause 5.5.4 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 DCHO 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 clause 14.2.1.0.2.2.

- TCHO\_execution is the UE conditional execution preparation time for conditional handover in clause 14.2.1.0.2.3.

- Tinterrupt is the interruption time stated in clause 14.2.1.0.2.4.

The conditional handover delay requirements are applied if condition T1-2 is later than the end of Tmeasure for time based CHO, or both condition D1-1 and condition D1-2 are fulfilled before the end of Tmeasure for location-based CHO, otherwise no CHO requirement is applied.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.1.

14.2.1.0.2.2 Measurement time

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 requirements for identifying a new detectable intra frequency cell measured without Time To Trigger (TTT) and L3 filtering, Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index, defined in TS 38.133 [6] clauses 9.2C.5.1 and 9.2C.6.1 are used.

For time-based conditional intra-frequency handover:

- If condition T1-1 occurs earlier than TEvent\_DU + Tidentify\_intra\_with\_index or TEvent\_DU + Tidentify\_intra\_without\_index, then the measurement time delay equal to Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index assuming UE only performs the measurements within SMTC window of the target cell.

- If condition T1-1 occurs later than TEvent\_DU + Tidentify\_intra\_with\_index or TEvent\_DU + Tidentify\_intra\_without\_index, then the measurement time delay equals to the time from the end of Tevent\_DU until condition T1-1.

For location-based conditional intra-frequency handover:

- If both condition D1-1 and condition D1-2 are fulfilled earlier than TEvent\_DU + Tidentify\_intra\_with\_index or TEvent\_DU + Tidentify\_intra\_without\_index, then the measurement time delay equal to Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index assuming UE only performs measurements within SMTC window of the target cell.

- If both condition D1-1 and condition D1-2 are fulfilled is later than TEvent\_DU plus Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index for intra-frequency handover, then the measurement time delay equal to the time from the end of Tevent\_DU until time when both condition D1-1 and condition D1-2 are fulfilled.

For inter-frequency handover, the requirements for identifying a new detectable inter frequency cell measured without Time To Trigger (TTT) and L3 filtering, Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index, defined in TS 38.133 [6] clause 9.3C.7.1 are used.

For time-based conditional inter-frequency handover:

- If condition T1-1 occurs earlier than TEvent\_DU + Tidentify\_inter\_with\_index or TEvent\_DU + Tidentify\_inter\_without\_index, then the measurement time delay equal to Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index assuming that the UE uses only the SMTC window of the target inter-frequency carrier for performing the measurements. In this case Ksatellite=1, CSSFinter=1.

- If condition T1-1 occurs later than TEvent\_DU + Tidentify\_inter\_with\_index or TEvent\_DU + Tidentify\_inter\_without\_index, then the measurement time delay equals to the time from the end of Tevent\_DU until condition T1-1.

For location-based conditional inter-frequency handover,

- If both condition D1-1 and condition D1-2 are fulfilled earlier than TEvent\_DU + Tidentify\_inter\_with\_index or TEvent\_DU + Tidentify\_inter\_without\_index, then the measurement time delay equal to Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index, assuming that the UE uses only the SMTC window of the target inter-frequency carrier for performing the measurements. In this case Ksatellite=1, CSSFinter=1.

- If both condition D1-1 and condition D1-2 are fulfilled later than TEvent\_DU plus Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index, then the measurement time delay equal to the time from the end of Tevent\_DU until time of both condition D1-1 and condition D1-2 are fulfilled.

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.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.2.

14.2.1.0.2.3 Preparation time

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.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.3.

14.2.1.0.2.4 Interruption time

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 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 SAN 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 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.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.4.

#### 14.2.1.1 NR SA FR1 Handover for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* Several test parameters and configuration are still in brackets
* AT command related configuration is FFS

14.2.1.1.1 Test purpose

To verify the requirement for Intra-frequency SAN Handover from FR1 to FR1 specified in clause 14.2.1.0.1.

14.2.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.1.

14.2.1.1.4 Test description

14.2.1.1.4.1 Initial conditions

The test scenario comprises of one NR carrier and two satellite access cells as given in tables 14.2.1.1.4.1-3 and 14.2.1.1.5-1. 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 may not have any timing information of Cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell with Event A3 report.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1. The RRC message implying handover to Cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover.

This test shall be tested using any of the test configurations in Table 14.2.1.1.4.1-1.

Table 14.2.1.1.4.1-1: Supported test configurations for NR SA FR1 Handover for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.2.1.1-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.1-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.1.4.1-2

Table 14.2.1.1.4.1-2: Initial conditions for NR SA FR1 Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.2.1.1.4.3.

2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test where Cell 2 is the target cell. Both Cell 1 and Cell 2 are satellite access cells.

3. The general test parameters are given in Table 14.2.1.1.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.1.1.4.1-3: General test parameters for NR SA FR1 Handover for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellites configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellites configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| A3-Offset | | dB | -1 | Modified by Test Tolerance |
| 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 | ≤5 |  |
| T3 | | s | 1 |  |

14.2.1.1.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.1.4.1-3. The handover delay is tested.

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 14.2.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.

4. UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.1.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3.

7. SS shall transmit the *RRCReconfiguration* message implying handover to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 14.2.1.1.5-1. T3 starts.

8. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms 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.

9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

10. After T3 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.

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

12. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

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

14.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 14.2.1.1.4.3-1: Common Exception messages for NR SA FR1 Handover for Satellite Access

|  |  |
| --- | --- |
| 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 no GAP NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells  Table H.3.1-4 with A3-offset = -1 dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.2-2 with Condition RBConfig\_KeyChange |

14.2.1.1.5 Test requirements

Table 14.2.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Handover for Satellite Access.

Table 14.2.1.1.5-1: Cell specific test parameters for NR SA FR1 Handover for Satellite Access

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | Config 1,2 |  | 1 | | | 1 | | |
| BWchannel | | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| BWP BW | | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| TACommon | | Config 1,2 | s | 0 | | | 0 | | |
| TACommonDrift | | s | 0 | | | 0 | | |
| TACommonDriftVariation | | s | 0 | | | 0 | | |
| Koffset | | Config 1 | ms | 239 | | | 239 | | |
|  | | Config 2 | 4 | | | 4 | | |
| Kmac | | Config 1,2 | ms | 0 | | | 0 | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC Configuration | |  | SMTC.1 | | | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 |  | 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 | | Config 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1,2 | dBm/ 15kHz | -98 | | | | | |
| Note2 | | dBm/ SCS | -98 | | | | | |
|  | | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
|  | | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| SSB\_RP | | dBm/ SCS | -90 | -90 | -90 | -Infinity | -88 | -88 |
| IoNote3 | | dBm/ 9.36MHz | -61.41 | -57.67 | -57.67 | -61.41 | -57.67 | -57.67 |
| 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. | | | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.

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 [13]. Tinterrupt is defined in clause 14.2.1.0.1.2.

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

Here: Tsearch = 0; TIU = 20ms; Tprocessing = 20ms; T∆ = 20ms; Tmargin = 2ms.

This gives a total of 72 ms.

#### 14.2.1.2 NR SA FR1-FR1 Handover for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* Several test parameters and configuration are still in brackets
* AT command related configuration is FFS
* Needs alignment with latest changes introduced in 38.133 (gap, SMTC, SSB configurations)
* Neighbour cell ephemeris needs further analysis

14.2.1.2.1 Test purpose

To verify the requirement for Inter-frequency SAN Handover from FR1 to FR1 specified in clause 14.2.1.0.1.

14.2.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.2.

14.2.1.2.4 Test description

14.2.1.2.4.1 Initial conditions

The test scenario comprises of two NR carriers and two satellite access cells as given in tables 14.2.1.2.4.1-3 and 14.2.1.2.5-1. 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 may not have any timing information of Cell 2. During T1, the UE is configured to measure inter frequency neighbour cell with Event A3 report and Gap Pattern 0 is configured in the test case.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1. The RRC message implying handover to Cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover.

This test shall be tested using any of the test configurations in Table 14.2.1.2.4.1-1.

Table 14.2.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 Handover for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.2.1.2-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.2-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.2.4.1-2

Table 14.2.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.2.1.2.4.3.

2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test where Cell 2 is the target cell. Both Cell 1 and Cell 2 are satellite access cells.

3. The general test parameters are given in Table 14.2.1.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.1.2.4.1-3: General test parameters for NR SA FR1-FR1 Handover for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellite configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| A3-Offset | | dB | 0 |  |
| 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 | ≤5 |  |
| T3 | | s | 1 |  |

14.2.1.2.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.2.1.2.4.1-3. The handover delay is tested.

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 14.2.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.

4. UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.2.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3.

7. SS shall transmit the *RRCReconfiguration* message implying handover to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 14.2.1.2.5-1. T3 starts.

8. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms 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.

9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

10. After T3 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.

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

12. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

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

14.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 14.2.1.2.4.3-1: Common Exception messages for NR SA FR1-FR1 Handover for Satellite Access

|  |  |
| --- | --- |
| 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 INTER-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells  Table H.3.1-4 with A3-offset = 0 dB  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.2-2 with Condition RBConfig\_KeyChange |

14.2.1.2.5 Test requirements

Table 14.2.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Handover for Satellite Access.

Table 14.2.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 Handover for Satellite Access

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | Config 1,2 |  | 1 | | | 2 | | |
| BWchannel | | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| BWP BW | | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| TACommon | | Config 1,2 | s | 0 | | | 0 | | |
| TACommonDrift | | s | 0 | | | 0 | | |
| TACommonDriftVariation | | s | 0 | | | 0 | | |
| Koffset | | Config 1 | ms | 239 | | | 239 | | |
|  | | Config 2 | 4 | | | 4 | | |
| Kmac | | Config 1,2 | ms | 0 | | | 0 | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC Configuration | |  | SMTC.1 | | | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 |  | 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 | | Config 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1,2 | dBm/ 15kHz | -98 | | | | | |
| Note2 | | dBm/ SCS | -98 | | | | | |
|  | | dB | 4 | 4 | 4 | -Infinity | 9 | 9 |
|  | | dB | 4 | 4 | 4 | -Infinity | 9 | 9 |
| SSB\_RP | | dBm/ SCS | -94 | -94 | -94 | -Infinity | -89 | -89 |
| IoNote3 | | dBm/ 9.36MHz | -64.59 | -64.59 | -64.59 | -70.05 | -60.53 | -60.53 |
| 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. | | | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.

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 [13]. Tinterrupt is defined in clause 14.2.1.0.1.2.

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

Here: Tsearch = 0; TIU = 20ms; Tprocessing = 20ms; T∆ = 20ms; Tmargin = 2ms.

This gives a total of 72 ms.

#### 14.2.1.3 NR SA FR1 Time-based Conditional Handover for Satellite Access

Editor's Note:

* Several test parameters and configuration are still in brackets
* AT command related configuration is FFS

14.2.1.3.1 Test purpose

This test is to verify the requirement for intra-frequency SAN time-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

14.2.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and time-based conditional handover.

14.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.3.

14.2.1.3.4 Test description

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. Immediately before the start of T1, the UE is configured to measure intra-frequency neighbour cell and with a time-based handover trigger to Cell 2 with Event *CondEvent* T1.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1 and time condition event *t1-Threshold-r17* is fulfilled.

14.2.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.3.4.1-1.

Table 14.2.1.3.4.1-1: Supported test configurations for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.2.1.3-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.3-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.3.4.1-2

Table 14.2.1.3.4.1-2: Initial conditions for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.2.1.3.4.1-3.

2. Message contents are defined in clause 14.2.1.3.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.1.3.4.1-3: General test parameters for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellite configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| *t1-Threshold-r17.condEventT1-r17* | | s | T1 | Entering condition at start of T2 (end of T1) |
| *duration-r17.condEventT1-r17* | | slot | 1000 | Give 1s search duration |
| *A3-Offset* in condition | | dB | -1 | Modified by Test Tolerance |
| 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 |  |

14.2.1.3.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.3.4.1-3. The handover delay is tested.

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. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration-r16* on Cell 1 to configure time-based CHO condition on the UE, as specified in Table 14.2.1.3.4.3-1.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.3.5-1. T2 starts.

6. If the UE transmits the PRACH preambles to Cell 2 less than 872 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, 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 + 3) mod 1008) for the next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

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

14.2.1.3.4.3 Message contents

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

Table 14.2.1.3.4.3-1: *RRCReconfiguration* for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 14.2.1.3.4.3-2 |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| conditionalReconfiguration-r16 | | ConditionalReconfiguration | Table 14.2.1.3.4.3-6 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 14.2.1.3.4.3-2: *MeasConfig* (Table 14.2.1.3.4.3-1) for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 14.2.1.3.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR-T1 | Table 14.2.1.3.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| ReportConfigToAddMod[2] SEQUENCE { |  | entry 2 |  |
| reportConfigId | 2 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR-A3 | Table 14.2.1.3.4.3-5 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries |  |  |
| MeasIdToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measId | 1 |  |  |
| measObjectId | 1 |  |  |
| reportConfigId | 1 |  |  |
| } |  |  |  |
| MeasIdToAddMod[2] SEQUENCE { |  | entry 2 |  |
| measId | 2 |  |  |
| measObjectId | 1 |  |  |
| reportConfigId | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 |  |  |
| } |  |  |  |

Table 14.2.1.3.4.3-3: *MeasObjectNR* (Table 14.2.1.3.4.3-2) for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 14.2.1.3.4.3-4: *ReportConfigNR-T1* (Table 14.2.1.3.4.3-2) for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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-r16 SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventT1-r17 SEQUENCE { |  |  |  |
| t1-Threshold-r17 | 100\*T | T is the time difference in seconds between start of T2 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms |  |
| duration-r17 | 10 | Each step represents 100ms (= 100 slots @ 15kHz SCS), so 1000 slots/100 slots = 10 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.2.1.3.4.3-5: *ReportConfigNR-A3* (Table 14.2.1.3.4.3-2) for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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-r16 SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -2 | actuall value = -2\*0.5 = -1dB |  |
| } |  |  |  |
| hysteresis | 0 | actuall value = 0\*0.5 = 0dB |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.2.1.3.4.3-6: *ConditionalReconfiguration* (Table 14.2.1.3.4.3-1) for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 { | 2 entries |  |  |
| MeasId[1] | 1 | entry 1  MeasId configured in Table 14.2.1.3.4.3-2  Event T1 |  |
| MeasId[2] | 2 | entry 2  MeasId configured in Table 14.2.1.3.4.3-2  Event A3 |  |
| } |  |  |  |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig\_NoKeyChange) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.2.1.3.5 Test requirements

Table 14.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Time-based Conditional Handover for Satellite Access.

Table 14.2.1.3.5-1: Cell specific parameters for NR SA FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2 |  | 1 | | 1 | |
| BWchannel | |  | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | |  | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1,2 | s | 0 | | 0 | |
| TACommonDrift | |  | s | 0 | | 0 | |
| TACommonDriftVariation | |  | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | 239 | | 239 | |
|  | | Config 2 | ms | 4 | | 4 | |
| Kmac | | Config 1,2 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1,2 |  | 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 | | Config 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1,2 | dBm/ 15kHz | -98 | | | |
| Note2 | | dBm/ SCS | -98 | | | |
|  | | dB | 8 | -2.41 | -Infinity | 1.36 |
|  | | dB | 8 | 8 | -Infinity | 10 |
| SSB\_RP | | dBm/ SCS | -90 | -90 | -Infinity | -88 |
| IoNote3 | | dBm/ 9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| 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. | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 872 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 is defined in clause 14.2.1.0.2.1, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

where:

RRC procedure delay TRRC = 10 ms and is specified in clause 12 in TS 38.331 [13].

TEvent\_DU = start of T2

Tmeasure = 600 + 200 ms; Tinterrupt = 62ms; TCHO\_execution = 10ms.

This gives a total of 872 ms.

#### 14.2.1.4 NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

Editor's Note:

* Several test parameters and configuration are still in brackets
* AT command related configuration is FFS
* Neighbor cell ephemeris needs further analysis

14.2.1.4.1 Test purpose

This test is to verify the requirement for inter-frequency SAN time-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

14.2.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and time-based conditional handover.

14.2.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.4.

14.2.1.4.4 Test description

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. Immediately before the start of T1, the UE is configured to measure inter-frequency neighbour cell with Gap pattern ID gp0 and time-based handover trigger to Cell 2 with Event *CondEvent* T1.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1 and after 1000ms of T2, time condition event *t1-Threshold-r17* is fulfilled.

14.2.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.4.4.1-1.

Table 14.2.1.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.2.1.4-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.4-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.4.4.1-2

Table 14.2.1.4.4.1-2: Initial conditions for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.2.1.4.4.1-3.

2. Message contents are defined in clause 14.2.1.4.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.1.4.4.1-3: General test parameters for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellite configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| t1-Threshold-r17.condEventT1-r17 | | s | T1+1 | Entering condition 1000ms after start of T2 |
| duration-r17.condEventT1-r17 | | slot | 1000 | Give 1s search duration |
| Gap Pattern Id | |  | 0 |  |
| Measurement gap offset | |  | 9 |  |
| A3-Offset in condition | | dB | 0 |  |
| 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 |  |

14.2.1.4.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.2.1.4.4.1-3. The handover delay is tested.

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. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.4.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration-r16* on Cell 1 to configure time-based CHO condition on the UE, as specified in Table 14.2.1.4.4.3-1.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.4.5-1. T2 starts.

6. If the UE transmits the PRACH preambles to Cell 2 later than 1000 ms and less than 1072 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, 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 + 3) mod 1008) for the next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

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

14.2.1.4.4.3 Message contents

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

Table 14.2.1.4.4.3-1: *RRCReconfiguration* for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 14.2.1.4.4.3-2 |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| conditionalReconfiguration-r16 | | ConditionalReconfiguration | Table 14.2.1.4.4.3-6 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 14.2.1.4.4.3-2: *MeasConfig* (Table 14.2.1.4.4.3-1) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entries |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR | Table 14.2.1.4.4.3-3 | Cell 1 |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod[2] SEQUENCE { |  | entry 2 |  |
| measObjectId | 2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR | Table 14.2.1.4.4.3-3 | Cell 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR-T1 | Table 14.2.1.4.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 2 |  |
| reportConfigId | 2 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR-A3 | Table 14.2.1.4.4.3-5 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries |  |  |
| MeasIdToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measId | 1 |  |  |
| measObjectId | 2 |  |  |
| reportConfigId | 1 |  |  |
| } |  |  |  |
| MeasIdToAddMod[2] SEQUENCE { |  | entry 2 |  |
| measId | 2 |  |  |
| measObjectId | 2 |  |  |
| reportConfigId | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 |  |  |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with conditions gapUE, Pattern #0 and gap offset = 9 |  |  |
| } |  |  |  |

Table 14.2.1.4.4.3-3: *MeasObjectNR* (Table 14.2.1.4.4.3-2) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  | Cell 1 |
|  | ARFCN-ValueNR for Cell 2 |  | Cell 2 |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.2 |  | Cell 1 |
|  | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.5 |  | Cell 2 |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 14.2.1.4.4.3-4: *ReportConfigNR-T1* (Table 14.2.1.4.4.3-2) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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-r16 SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventT1-r17 SEQUENCE { |  |  |  |
| t1-Threshold-r17 | 100\*T | T is the time difference in seconds between 1000ms after the start of T2 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms |  |
| duration-r17 | 10 | Each step represents 100ms (=100 slots @ 15kHz SCS), so 1000 slots/100 slots = 10 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.2.1.4.4.3-5: *ReportConfigNR-A3* (Table 14.2.1.4.4.3-2) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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-r16 SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | 0 | actuall value = 0\*0.5 = 0dB |  |
| } |  |  |  |
| hysteresis | 0 | actuall value = 0\*0.5 = 0dB |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.2.1.4.4.3-6: *ConditionalReconfiguration* (Table 14.2.1.4.4.3-1) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 { | 2 entries |  |  |
| MeasId[1] | 1 | entry 1  The MeasId configured in Table 14.2.1.4.4.3-2  Event T1 |  |
| MeasId[2] | 2 | entry 2  The MeasId configured in Table 14.2.1.4.4.3-2  Event A3 |  |
| } |  |  |  |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig\_NoKeyChange) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.2.1.4.5 Test requirements

Table 14.2.1.4.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access.

Table 14.2.1.4.5-1: Cell specific parameters for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2 |  | 1 | | 2 | |
| BWchannel | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1, 2 | s | 0 | | 0 | |
| TACommonDrift | | s | 0 | | 0 | |
| TACommonDriftVariation | | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | 239 | | 239 | |
|  | | Config 2 | ms | 4 | | 4 | |
| Kmac | | Config 1, 2 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.2 | | SMTC.5 | |
| SSB Configuration | |  | SSB.1 FR1 | | SSB.5 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2 |  | 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 | | Config 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1, 2 | dBm/ 15kHz | -98 | | | |
| Note2 | | dBm/ SCS | -98 | | | |
|  | | dB | 4 | 4 | -Infinity | 9 |
|  | | dB | 4 | 4 | -Infinity | 9 |
| SSB\_RP | | dBm/ SCS | -94 | -94 | -Infinity | -89 |
| IoNote3 | | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -60.53 |
| 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. | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 later than 1000ms and less than 1072 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 is defined in clause 14.2.1.0.2.1, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

where:

RRC procedure delay TRRC = 10 ms and is specified in clause 12 in TS 38.331 [13].

TEvent\_DU = start of T2

Tmeasure = max(600 + 200, 1000) ms; Tinterrupt = 62ms; TCHO\_execution = 10ms.

This gives a total of 1072 ms.

#### 14.2.1.5 NR SA FR1 Distance-based Conditional Handover for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete

- Message contents are FFS

- Call setup and test procedure needs to be updated

- Several test parameters and configuration are still in brackets

- Annex E and F need to be updated

14.2.1.5.1 Test purpose

This test is to verify the requirement for intra-frequency SAN distance-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

14.2.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, distance-based conditional handover, and inter-satellite measurements.

14.2.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.5.

14.2.1.5.4 Test description

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. During T1, the UE is configured to measure intra-frequency neighbour cell. The RRC message implying distance-based handover to cell 2 with Event *CondEvent* D1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and offset better than cell 1 and location condition event *condEventD1-r17* is fulfilled.

14.2.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.5.4.1-1.

Table 14.2.1.5.4.1-1: Supported test configurations for NR SA FR1 Distance-based Conditional Handover for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.2.1.5-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.5-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.5.4.1-2

Table 14.2.1.5.4.1-2: Initial conditions for NR SA FR1 Distance-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.2.1.5.4.1-3.

2. Message contents are defined in clause 14.2.1.5.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.1.5.4.1-3: General test parameters for NR SA FR1 Distance-based Conditional Handover for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellite configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) at T1 start | |  | [(0, 0, 0)] | Set by AT command |
| UE moving speed | | km/h | [(108, 0, 0)] | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | [(-700, 0, 0)] | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | [(1300, 0, 0)] | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | [20] | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | [20] | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 |  |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 |  |
| A3-Offset in condition | | dB | 0 |  |
| 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 | 12 |  |
| T2 | | s | ≤ 6 |  |

14.2.1.5.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.5.4.1-3. Both handover delay and interruption length are tested.

Time interval T1 needs to start immediately after the UE position and moving speed are configured via AT commands.

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]. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. UE position and moving speed are configured on the UE via AT commands. Immediately after that, T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message [with *conditionalReconfiguration* on Cell 1] to configure distance-based CHO condition on the UE.

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 14.2.1.5.5-1. T2 starts.

6. If the UE transmits the PRACH preambles to Cell 2 less than 872 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, [the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*] to cause UE handover back to Cell 1. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2). If the handover back to Cell 1 was successful go to step 9. If the handover back to Cell 2 was not successful, go to step 8.

8. Switch off and then on the UE and go to step 1.

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

14.2.1.5.4.3 Message contents

FFS

14.2.1.5.5 Test requirements

Table 14.2.1.5.5-1 defines the primary level settings including test tolerances for NR SA FR1 Distance-based Conditional Handover for Satellite Access.

Table 14.2.1.5.5-1: Cell specific parameters for NR SA FR1 Distance-based Conditional Handover for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2 |  | 1 | | 1 | |
| BWchannel | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1, 2 | s | 0 | | 0 | |
| TACommonDrift | | s | 0 | | 0 | |
| TACommonDriftVariation | | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | 239 | | 239 | |
|  | | Config 2 | ms | 4 | | 4 | |
| Kmac | | Config 1, 2 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2 |  | 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 | | Config 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1, 2 | dBm/ 15kHz | -98+TT | | | |
| Note2 | | dBm/ SCS | -98+TT | | | |
|  | | dB | 8+TT | -3.3+TT | -Infinity | 2.36+TT |
|  | | dB | 8+TT | 8+TT | -Infinity | 11+TT |
| SSB\_RP | | dBm/ SCS | -90+TT | -90+TT | -Infinity | -87+TT |
| IoNote3 | | dBm/ 9.36MHz | -61.41+TT | -57.06+TT | -61.41+TT | -57.06+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. | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 872 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 is defined in 38.133 [6] clause 6.1C.2, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

where:

RRC procedure delay TRRC = 10 ms and is specified in clause 12 in TS 38.331 [13].

TEvent\_DU = start of T2

UE moving speed, v = (108km/h\*1000/3600) = 30m/s.

At start of T2,

distance to source cell reference location is 30 m/s \* 12 s – (-700)m = 1060m, and D1-1 = 1000m

distance to target cell reference location is 30 m/s \* 12 s – 1300m = -940m, and D1-2 = 1000m

i.e. D1-1 and D1-2 conditions are fulfilled at start of T2 with >=50m location margin.

Tmeasure = max(600 + 200 ms, 0) = 800 ms;

Tinterrupt = 62ms; TCHO\_execution = 10ms.

This gives a total of 800ms + 62ms + 10ms = 872 ms.

#### 14.2.1.6 NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete

- Message contents are FFS

- Call setup and test procedure needs to be updated

- Several test parameters and configuration are still in brackets

- Annex E and F need to be updated

14.2.1.6.1 Test purpose

This test is to verify the requirement for inter-frequency SAN distance-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

14.2.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, distance-based conditional handover, and inter-satellite measurements.

14.2.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.6.

14.2.1.6.4 Test description

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. During T1, the UE is configured to measure inter-frequency neighbour cell and Gap pattern ID gp0. The RRC message implying distance-based handover to cell 2 with Event D1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and offset better than cell 1 and after 11670ms of T2, location condition event *condEventD1-r17* is fulfilled.

14.2.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.6.4.1-1.

Table 14.2.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.2.1.6-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.6-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.6.4.1-2

Table 14.2.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.2.1.6.4.1-3.

2. Message contents are defined in clause 14.2.1.6.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.1.6.4.1-3: General test parameters for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellite configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) at T1 start | |  | [(0, 0, 0)] | Set by AT command |
| UE moving speed | | km/h | [(108, 0, 0)] | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | [(-700, 0, 0)] | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | [(1300, 0, 0)] | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | [20] | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | [20] | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 |  |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 |  |
| A3-Offset in condition | | dB | 0 |  |
| 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 | 1 |  |
| T2 | | s | 12 |  |

14.2.1.6.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.2.1.6.4.1-3. Both handover delay and interruption length are tested.

Time interval T1 needs to start immediately after the UE position and moving speed are configured via AT commands.

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]. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.6.5-1. Propagation conditions are set according to Annex C clause C.2.2. UE position and moving speed are configured on the UE via AT commands. Immediately after that, T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message [with *conditionalReconfiguration* on Cell 1] to configure distance-based CHO condition on the UE.

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 14.2.1.6.5-1. T2 starts.

6. If the UE transmits the PRACH preambles to Cell 2 less than 11741 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, [the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*] to cause UE handover back to Cell 1. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2). If the handover back to Cell 1 was successful go to step 9. If the handover back to Cell 2 was not successful, go to step 8.

8. Switch off and then on the UE and go to step 1.

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

14.2.1.6.4.3 Message contents

FFS

14.2.1.6.5 Test requirements

Table 14.2.1.6.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access.

Table 14.2.1.6.5-1: Cell specific parameters for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2 |  | 1 | | 2 | |
| BWchannel | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1, 2 | s | 0 | | 0 | |
| TACommonDrift | | s | 0 | | 0 | |
| TACommonDriftVariation | | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | 239 | | 239 | |
|  | | Config 2 | ms | 4 | | 4 | |
| Kmac | | Config 1, 2 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2 |  | 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 | | Config 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1, 2 | dBm/ 15kHz | -98+TT | | | |
| Note2 | | dBm/ SCS | -98+TT | | | |
|  | | dB | 4+TT | 4+TT | -Infinity | 9+TT |
|  | | dB | 4+TT | 4+TT | -Infinity | 9+TT |
| SSB\_RP | | dBm/ SCS | -94+TT | -94+TT | -Infinity | -89+TT |
| IoNote3 | | dBm/ 9.36MHz | -64.59+TT | -64.59+TT | -70.05 | -60.53+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. | | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 later than 11670ms and less than 11741 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 is defined in 38.133 [6] clause 6.1C.2, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

where:

RRC procedure delay TRRC = 10 ms and is specified in clause 12 in TS 38.331 [13].

TEvent\_DU = start of T2

UE moving speed, v = (108km/h\*1000/3600) = 30m/s.

At 11670ms after start of T2,

distance to source cell reference location is 30 m/s \* 11.67 s – (-700)m = 1050m, and D1-1 = 1000m

distance to target cell reference location is 30 m/s \* 11.67 s – 1300m = -950m, and D1-2 = 1000m

i.e. D1-1 and D1-2 conditions are fulfilled at T2 + 11670ms with >=50m location margin.

Tmeasure = max(600 + 200 ms, 11670ms) = 11670ms;

Tinterrupt = 62ms; TCHO\_execution = 10ms.

This gives a total of 11670ms + 62ms + 10ms = 11741 ms.

### 14.2.2 RRC Connection Mobility Control for SAN

#### 14.2.2.1 RRC Re-establishment for SAN

##### 14.2.2.1.0 Minimum conformance requirements for RRC Re-establishment for Satellite Access

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:

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 of TS 38.331 [13] 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:

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

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1, and

- the conditions of SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.17 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 TS 38.133 [6] clause 10.1.4 are fulfilled for a corresponding NR Band for FR1, and

- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.18 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. 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 14.2.2.1.0-1.

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. Tidentify\_inter\_NR,i shall not exceed the values defined in Table 14.2.2.1.0-2.

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 [13] signaling 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 [13] 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 [8].

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.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

The requirements in this clause apply provided that the ephemeris information provided by the serving cell for the target cell is valid during UE re-establishment delay (TUE\_re-establish\_delay).

Table 14.2.2.1.0-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

|  |  |  |  |
| --- | --- | --- | --- |
| Serving cell | FR of target NR | Tidentify\_intra\_NR [ms] | |
| SSB Ês/Iot (dB) | cell | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x TSMTC) | Kmulti\_SMTC \* MAX (800 ms, 10 x TSMTC) |
| < -8 | FR1 | N/A | k \* 800 ms Note1, 3 |
| 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.  Note 2: Kmulti\_SMTC is defined in TS 38.133 [6] clause 9.2C.5.1.  Note 3: k = 1 if the cells on the target frequency are served by GEO. k = (N+1) if the cells on the target frequency are served by LEO, where N is the number of different satellites associated to the list of configured neighbor cells in ntn-NeighCellConfigList and ntn-NeighCellConfigListExt. | | | |

Table 14.2.2.1.0-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

|  |  |  |  |
| --- | --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | 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) | K\_satellite \* MAX (800 ms, 13 x TSMTC, i) |
| < -8 | FR1 | N/A | k \* 800 ms Note1, 3 |
| 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.  Note 2: K\_satellite is defined in TS 38.133 [6] clause 9.3C.4.  Note 3: k = 1 if the cells on the target frequency are served by GEO. k = (N+1) if the cells on the target frequency are served by LEO, where N is the number of different satellites associated to the list of configured neighbor cells in ntn-NeighCellConfigList and ntn-NeighCellConfigListExt. | | | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2C.1.

##### 14.2.2.1.1 NR SA FR1 RRC Re-establishment for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Message contents may need to be updated
* Applicability may need to be updated
* Several test parameters and configuration are still TBD or need to be recalculated
* Re-establishment delay calculation needs to be aligned with legacy tests

14.2.2.1.1.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. This test will verify the requirements in clause 14.2.2.1.0.

14.2.2.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.2.2.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.2.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.1.1.

14.2.2.1.1.4 Test description

The test parameters are given in Table 14.2.2.1.1.4.1-3 and Table 14.2.2.1.1.5-1 below. 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, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

14.2.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.1.1.4.1-1.

**Table 14.2.2.1.1.4.1-1: Supported test configurations for NR SA FR1 RRC Re-establishment for Satellite Access**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 14.2.2.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.2.2.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.2.2.1.1.4.1-2.

**Table 14.2.2.1.1.4.1-2: Initial conditions for NR SA FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.2.2.1.1.4.3.

2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 1 and Cell 2 are satellite access cells.

3. The test parameters are given in Table 14.2.2.1.1.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.1.1.4.1-3: General test parameters for NR SA FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell1 |  |
|  | Neighbour cells |  | 1, 2 | Cell2 |  |
| Final condition | Active cell |  | 1, 2 | Cell2 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| N310 | | - | 1, 2 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | |  | 1, 2 | SMTC.2 |  |
| DRX cycle length | | s | 1, 2 | OFF |  |
| PRACH configuration | |  | 1, 2 | PRACH.1 FR1 |  |
| T1 | | s | 1, 2 | 5 |  |
| T2 | | ms | 1, 2 | 640 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1C of TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1C.5 of TS 38.133 [6]) |
| T3 | | s | 1, 2 | 2 |  |

14.2.2.1.1.4.2 Test Procedure

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* 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 Table 14.2.2.1.1.5-1. 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 14.2.2.1.1.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 14.2.2.1.1.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within [FFS ms (= FFSms + FFS s) 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.

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

14.2.2.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.2.2.1.1.4.3-1: Common Exception messages for NR SA FR1 RRC Re-establishment for Satellite Access**

|  |  |
| --- | --- |
| **Default Message Contents** | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.2.2.1.1.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| t311 | ms3000 |  |  |
| n311 | n1 |  |  |
| } |  |  |  |

14.2.2.1.1.5 Test Requirement

Table 14.2.2.1.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 RRC Re-establishment for Satellite Access.

**Table 14.2.2.1.1.5-1: Cell-specific test parameters for NR SA FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | | | Cell 2 | | | | |
|  |  |  | T1 | | T2 | | T3 | T1 | T2 | | | T3 |
| Satellite information |  | 1 | SSC.1 | | | | | NSC.1 | | | | |
|  |  | 2 | SSC.2 | | | | | NSC.2 | | | | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | | | | SR.1.1 FDD | | | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | | | | CR.1.1 FDD | | | | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | | | | CCR.1.1 FDD | | | | |
| OCNG Pattern |  | 1, 2 | OP.1 | | | | | OP.1 | | | | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | | | | TRS.1.1 FDD | | | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | | | DLBWP.0.1 | | | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | | | ULBWP.0.1 | | | | |
| Active DL BWP confgiuration |  | 1, 2 | DLBWP.1.1 | N/A | | N/A | | N/A | | N/A | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | N/A | | N/A | | N/A | | N/A | ULBWP.1.1 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | | | | SSB.1 FR1 | | | | |
| RLM-RS |  | 1, 2 | SSB | | | | | SSB | | | | |
|  | dB | 1, 2 | 1.54+TT | | -infinity | | -infinity | -3.79+TT | 4+TT | | | 4+TT |
| Note2 | dBm/SCS | 1, 2 | -98+TT | | | | | | | | | |
| Note2 | dBm/15 kHz | 1, 2 | -98+TT | | | | | | | | | |
|  | dB | 1, 2 | 7+TT | | -infinity | | -infinity | 4+TT | 4+TT | | | 4+TT |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -91+TT | | -infinity | | -infinity | -94+TT | -94+TT | | | -94+TT |
| Io | dBm/9.36 MHz | 1, 2 | -60.74+TT | | -64.59+TT | | -64.59+TT | -60.74+TT | -64.59+TT | | | -64.59+TT |
| 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. | | | | | | | | | | | | |

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 a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

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 = 200 ms

TSI = 1280 ms, provided that SIB1 and SIB19 are scheduled with 20ms period; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] 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 [1545] ms, allow [1.6] s in the test case.

##### 14.2.2.1.2 NR SA FR1-FR1 RRC Re-establishment for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Message contents may need to be updated
* Applicability may need to be updated
* Several test parameters and configuration are still TBD or need to be recalculated
* Re-establishment delay calculation needs to be aligned with legacy tests

14.2.2.1.2.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. This test will verify the requirements in clause 14.2.2.1.0.

14.2.2.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.2.2.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.2.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.1.2.

14.2.2.1.2.4 Test description

The test parameters are given in Table 14.2.2.1.2.4.1-3 and Table 14.2.2.1.2.5-1 below. 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.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

14.2.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.1.2.4.1-1.

**Table 14.2.2.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 14.2.2.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.2.2.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.2.2.1.2.4.1-2.

**Table 14.2.2.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.2.2.1.2.4.3.

2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 1 and Cell 2 are satellite access cells.

3. The test parameters are given in Table 14.2.2.1.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.1.2.4.1-3: General test parameters for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell1 |  |
|  | Neighbour cells |  | 1, 2 | Cell2 |  |
| Final condition | Active cell |  | 1, 2 | Cell2 |  |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | |  | 1, 2 | 3 ms | Asynchronous cells |
| N310 | | - | 1, 2 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | |  | 1, 2 | SMTC.2 |  |
| DRX cycle length | | s | 1, 2 | OFF |  |
| PRACH configuration | |  | 1, 2 | PRACH.1 FR1 |  |
| T1 | | s | 1, 2 | 5 |  |
| T2 | | ms | 1, 2 | 640 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1C of TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1C.5 of TS 38.133 [6] ) |
| T3 | | s | 1, 2 | 5 |  |

14.2.2.1.2.4.2 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. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 14.2.2.1.2.5-1. 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 14.2.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 14.2.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within [FFS ms (= FFSms + FFS s) 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.

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

14.2.2.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.2.2.1.2.4.3-1: Common Exception messages for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

|  |  |
| --- | --- |
| **Default Message Contents** | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.2.2.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| n310 | n1 |  |  |
| t311 | ms5000 |  |  |
| n311 | n1 |  |  |
| } |  |  |  |

14.2.2.1.2.5 Test Requirement

Table 14.2.2.1.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1-FR1 RRC Re-establishment for Satellite Access.

**Table 14.2.2.1.2.5-1: Cell-specific test parameters for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | | |
|  |  |  | T1 | | T2 | T3 | T1 | T2 | | | T3 |
| Satellite information |  | 1 | SSC.1 | | | | NSC.1 | | | | |
|  |  | 2 | SSC.2 | | | | NSC.2 | | | | |
| RF Channel Number |  | 1, 2 | 1 | | | | 2 | | | | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | | | SR.1.1 FDD | | | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | | | CR.1.1 FDD | | | | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | | | CCR.1.1 FDD | | | | |
| OCNG Pattern |  | 1, 2 | OP.1 | | | | OP.1 | | | | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | | DLBWP.0.1 | | | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | | ULBWP.0.1 | | | | |
| Active DL BWP confgiuration |  | 1, 2 | DLBWP.1.1 | N/A | | N/A | N/A | | N/A | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | N/A | | N/A | N/A | | N/A | ULBWP.1.1 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | | | SSB.1 FR1 | | | | |
| RLM-RS |  | 1, 2 | SSB | | | | SSB | | | | |
|  | dB | 1, 2 | 4+TT | | -infinity | -infinity | -infinity | -infinity | | | 7+TT |
| Note2 | dBm/SCS | 1, 2 | -98+TT | | | | | | | | |
| Note2 | dBm/15 kHz | 1, 2 | -98+TT | | | | | | | | |
|  | dB | 1, 2 | 4+TT | | -infinity | -infinity | -infinity | -infinity | | | 7+TT |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -94+TT | | -infinity | -infinity | -infinity | -infinity | | | -91+TT |
| Io | dBm/9.36 MHz | 1, 2 | -64.59+TT | | -70. 05+TT | -70. 05+TT | -70. 05+TT | -70. 05+TT | | | -62.26+TT |
| 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. | | | | | | | | | | | |

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 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

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 = 2

Tidentify\_intra\_NR = 800 ms

Tidentify\_inter\_NR = 800 ms

TSI = 1280 ms, provided that SIB1 and SIB19 are scheduled with 20ms period; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target inter-frequency NR cell.

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of [2945] ms, allow [3] s in the test case.

#### 14.2.2.4 NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Message contents need to be updated
* Applicability needs to be updated
* Test procedure needs to be updated
* Annex E and F need to be updated

14.2.2.4.1 Test purpose

This test is to verify the requirement for RACH-based hard satellite switching with re-synchronization from SAN FR1 to SAN FR1 specified in clause 14.2.2.4.4.

14.2.2.4.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access and [RACH-based hard satellite switching with re-synchronization].

14.2.2.4.3 Minimum conformance requirement

The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, Koffset, and Kmac for target NR SAN cell during Dswitch\_unchangedPCI, otherwise interruption time may be longer than the requirements in clause 14.2.2.4.3.2.

Requirements for hard satellite switching are applicable for UEs that support *hardSatelliteSwitchResyncNTN-r18* or *softSatelliteSwitchResyncNTN-r18* [11] when the network configures hard satellite switching with resynchronization [13]; or for UEs that support *hardSatelliteSwitchResyncNTN*-r18 but do not support *softSatelliteSwitchResyncNTN-r18* when the network configures soft satellite switching with resynchronization.

14.2.2.4.3.1 Satellite switching delay

When the UE receives a broadcast message implying satellite switching within re-synchronization, the UE shall be ready to start the transmission of the new uplink PRACH channel or transmission of the new uplink PUSCH channel within Dswitch\_unchangedPCI msec.

Where:

- Dswitch\_unchangedPCI equals to the interruption time stated in clause 14.2.2.4.3.2.

14.2.2.4.3.2 Interruption time for hard satellite switch with re-sync

The interruption time is the time between *t-service* and the time when the UE is ready to receive any DL channel/signal and transmit any UL channel/signal from/to the target satellite.

When intra-frequency hard switch to NR SAN cell is commanded,

the interruption time shall be less than Tinterrupt

Tinterrupt = Tsearch + Tprocessing + T∆ + Tmargin ms

Otherwise, no interruption time requirement is applied.

Where:

- Tsearch is the time required to search the target NR SAN cell assuming the target cell is not already known when UE starts synchronizing with target satellite. If the target cell Es/Iot ≥ -2 dB, then Tsearch = Tfirst\_SSB ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

- T∆ is same as the one defined in TS 38.133 [6] section 6.1C.1.2.2.1.

- Tprocessing is time for UE processing. Tprocessing can be up to 10 ms.

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

- Tfirst\_SSB is the time to the end of the first complete SSB burst of target satellite, the location of which is determined by the periodicity and location of SSB of the source satellite, and if *ssb-TimeOffset* is configured, the *ssb-TimeOffset* and the difference between propagation delay of the serving satellite and the target satellite counted from the *SSB-TimeOffset* reference point as defined in TS 38.331 [13] to UE.

UE is allowed to skip measurements for other cells and satellites than the target satellite and source satellite from *T-service* until the satellite switch completion.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.3.

14.2.2.4.4 Test description

The test scenario comprises of 1 NR FDD carrier and 2 cells with same PCI as given in Tables 14.2.2.4.4.1-1, 14.2.2.4.4.1-3, 14.2.2.4.5-1 and 14.2.2.4.5-2. Both satellite switching delay and interruption length are tested.

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. During T1, The SIB19 implying *t-service-r17* andtarget satellite configuration *SatSwitchWithReSync-r18* shall be sent to UE. The target satellite configuration is in Table 14.2.2.4.5-1.

At the start of time duration T2, Cell 2 becomes detectable and *t-service-r17* of Cell 1 is fulfilled.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.4.

14.2.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.4.4.1-1.

Table 14.2.2.4.4.1-1: Supported test configurations for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 14.2.2.4-1 | NGSO, NR FDD, 15 kHz SSB SCS, 10 MHz BW |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.4.4.1-2.

Table 14.2.2.4.4.1-2: Initial conditions for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.2.2.4.4.3.

2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

3. The test parameters are given in Table 14.2.2.4.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.2.4.4.1-3: General test parameters for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Final condition | Active cell |  | Cell 2 |  |
| UE position (N,S, H) | |  | (0, 0, 0) | Set by AT command |
| Access Barring Information | | - | Not barred | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |

14.2.2.4.4.2 Test Procedure

In this test Cell 1 and Cell 2 have the same physical cell identity. This identity does not change across iterations.

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 according to T1 in Table 14.2.2.4.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message, configuring [RACH-based hard satellite switching on the UE] as specified in section 14.2.2.4.4.3.

4. UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.4.5-1. [This causes *t-Service-r17* of Cell 1 to be fulfilled].

6. The UE shall start satellite switching on Cell 2. If the UE transmits the uplink PRACH channel to Cell 2 less than 52.5 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, 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. Once the connection is released, the SS shall switch off and then on the UE.

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

14.2.2.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

FFS

14.2.2.4.5 Test Requirement

Table 14.2.2.4.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access.

Table 14.2.2.4.5-1: Cell-specific test parameters for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

| Parameter | | Unit | Cell 1Note1 | | Cell 2Note1 | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T1 | T2 |
| Satellite configurationNote2 | |  | SSC.2 | N/A | N/A | SSC.2 |
| BWchannel | | MHz | 10: NPRB,c = 52 |  |  | 10: NPRB,c = 52 |
| BWP BW | | MHz | 10: NPRB,c = 52 |  |  | 10: NPRB,c = 52 |
| Kmac | | ms | 0 |  |  | 0 |
| DRX Cycle | | ms | Not Applicable |  |  | Not Applicable |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD |  |  | SR.1.1 FDD |
| CORESET Reference Channel | |  | CR.1.1 FDD |  |  | CR.1.1 FDD |
| TRS configuration | |  | TRS.1.1 FDD |  |  | TRS.1.1 FDD |
| OCNG Patterns | |  | OP.1 |  |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |  |  | SMTC.1 |
| SSB Configuration | |  | SSB.1 FR1 |  |  | SSB.1 FR1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz |  |  | 15 kHz |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz |  |  | 15 kHz |
| PRACH configuration | |  | FR1 PRACH configuration 1 |  |  | FR1 PRACH configuration 1 |
| 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) | |  |  |  |  |
| Note3 | | dBm/ 15 kHz | -98+TT | | | |
| Note3 | | dBm/ SCS | -98+TT | | | |
|  | | dB | 8+TT | -Infinity | -Infinity | 8+TT |
|  | | dB | 8+TT | -Infinity | -Infinity | 8+TT |
| SSB\_RP | | dBm/ SCS | -90+TT | -Infinity | -Infinity | -90+TT |
| IoNote4 | | dBm/ 9.36 MHz | -61.41+TT | -61.41+TT | -61.41+TT | -61.41+TT |
| Propagation condition | | - | AWGN | | | |
| NOTE 1: Cell 1 and Cell 2 have same PCI. Satellite serving for Cell 1 and Satellite serving for Cell 2 are two different NGSO satellites.  NOTE 2: SSB transmit timing from TE should fit the SSB-timeOffset and the nominal propagation delay difference between serving satellite and target satellite. The nominal propagation delay is counted from the SSB-TimeOffset reference point to UE, which based on satellite locations and UE location known to the TE in this test case.  NOTE 3: 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 4: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 5: 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 14.2.2.4.5-2: Target Satellite configuration pattern for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

|  |  |
| --- | --- |
| Parameter | TSC.1 |
| Interval between adjacent epoch time | 2.56 s |
| ntn-UlSyncValidityDuration | 5 s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |
| ssb-TimeOffset | 0 |

The UE shall start to transmit the PRACH to Cell 2 less than 52.5 ms from the beginning of time period T2.

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

NOTE: The hard satellite switch with re-sync delay Dswitch\_unchangedPCI can be expressed as: Tinterrupt, where:

Tinterrupt is defined in clause 14.2.2.4.3.2.

Dswitch\_unchangedPCI = Tinterrupt = Tsearch + Tprocessing + T∆ + Tmargin ms

Here: Tsearch = Tfirst\_SSB = 0.5ms; Tprocessing = 10ms; T∆ = 20ms; Tmargin = 2ms.

Besides, interruption uncertainty TIU = 20ms in acquiring the first PRACH transmission resource is needed.

This gives a total of 52.5 ms.

#### 14.2.2.5 NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Message contents need to be updated
* Applicability needs to be updated
* Test procedure needs to be updated
* Annex E and F need to be updated

14.2.2.5.1 Test purpose

This test is to verify the requirement for RACH-less soft satellite switching with re-synchronization from SAN FR1 to SAN FR1 specified in clause 14.2.2.5.4.

14.2.2.5.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access and [RACH-less soft satellite switching with re-synchronization].

14.2.2.5.3 Minimum conformance requirement

The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, Koffset, and Kmac for target NR SAN cell during Dswitch\_unchangedPCI, otherwise interruption time may be longer than the requirements in clause 14.2.2.5.3.2.

Requirements for soft satellite switching are applicable for UEs that support *softSatelliteSwitchResyncNTN-r18* [11]when network configures soft satellite switching with resynchronization [13].

14.2.2.5.3.1 Satellite switching delay

When the UE receives a broadcast message implying satellite switching within re-synchronization, the UE shall be ready to start the transmission of the new uplink PRACH channel or transmission of the new uplink PUSCH channel within Dswitch\_unchangedPCI msec.

Where:

- Dswitch\_unchangedPCI equals to the interruption time stated in clause 14.2.2.5.3.2.

14.2.2.5.3.2 Interruption time for hard satellite switch with re-sync

The Satellite switch delay is from *t-serviceStart* to the time instance when UE is ready to receive any DL channel/signal and transmit any UL channel/signal from/to the target satellite.

When intra-frequency soft switch to NR SAN cell is commanded,

the satellite switch time shall be less than Tsoft\_switch

Tsoft\_switch = max(*t-service*-*t-seviceStart*, Tsearch + T∆ + Tmargin) + Tprocessing ms

Where:

- Tsearch is the time required to search the target NR SAN cell assuming the target cell is not already known when the handover command is received by the UE. If the target cell Es/Iot ≥ -2 dB, then Tsearch = Tfirst\_SSB ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

- T∆ is same as the one defined in TS 38.133 [6] section 6.1C.2.2.2.1.

- Tprocessing is time for UE processing. Tprocessing can be up to 10 ms.

- Tmargin is same as the one defined in TS 38.133 [6] section 6.1C.2.2.2.1.

- Tfirst\_SSB is the time to the end of the first complete SSB burst of target satellite, the location of which is determined by the periodicity and location of SSB of the source satellite, the *ssb-TimeOffset* and the difference between propagation delay of the serving satellite and the target satellite counted from *SSB-TimeOffset* reference point as defined in 38.331 [13] to UE.

During the time period from *t-seviceStart* to *t-service*, scheduling restriction as defined in TS 38.133 [6] clause 9.2C.5.3 is allowed, with the exception that the locations of SSB symbols of target satellite where scheduling restriction applies are determined by the periodicity and location of SSB of the source satellite, the *ssb-TimeOffset* and the difference between propagation delay of the serving satellite and the target satellite counted from the *SSB-TimeOffset* reference point as defined in TS 38.331 [13] to UE.

UE is allowed to skip measurements for other cells and satellites than the target satellite and source satellite from *t-seviceStart* to the satellite switch completion.

The requirement in this clause applies and UE is required to keep the connection (DL and UL) with the source NGSO satellite, under the following conditions:

- SSBs from the two satellites are spaced apart from each other at least by 1 OFDM symbol in the time domain at UE Rx side.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.3.

14.2.2.5.4 Test description

The test scenario comprises of 1 NR FDD carrier and 2 cells with same PCI as given in Tables 14.2.2.5.4.1-1, 14.2.2.5.4.1-3, 14.2.2.5.5-1 and 14.2.2.5.5-2. Satellite switching delay is tested.

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 may not have any timing information of Cell 2. During T1, The SIB19 implying *t-service-r17* andtarget satellite configuration *SatSwitchWithReSync-r18* shall be sent to UE. The target satellite configuration is in table 14.2.2.5.5-1. The configured grant PUSCH transmission in the Cell 2 is configured in the RRC message from Cell 1.

At the start of time duration T2, Cell 2 becomes detectable and *t-ServiceStart-r18* is fulfilled.

At the start of time duration T3, *t-service-r17* of Cell 1 is fulfilled.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.5.

14.2.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.5.4.1-1.

Table 14.2.2.5.4.1-1: Supported test configurations for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 14.2.2.5-1 | NGSO, NR FDD, 15 kHz SSB SCS, 10 MHz BW |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.5.4.1-2.

Table 14.2.2.5.4.1-2: Initial conditions for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.2.2.5.4.3.

2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

3. The test parameters are given in Table 14.2.2.5.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.2.2.5.4.1-3: General test parameters for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Final condition | Active cell |  | Cell 2 |  |
| UE position (N,S, H) | |  | (0, 0, 0) | Set by AT command |
| Access Barring Information | | - | Not barred | No additional delays in random access procedure. |
| timeDomainOffset | |  | 0 |  |
| timeDomainAllocation | |  | 0 | PUSCH MappingType A  *startSymbol S=0*  *Length* L=14 |
| timeReferenceSFN-r16 | |  | sfn512 |  |
| Periodcity | |  | sym10x14 |  |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | ms | 100 |  |
| T3 | | s | ≤5 |  |

14.2.2.5.4.2 Test Procedure

In this test Cell 1 and Cell 2 have the same physical cell identity. This identity does not change across iterations.

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 according to T1 in Table 14.2.2.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message, configuring [RACH-less soft satellite switching on the UE] as specified in section 14.2.2.5.4.3.

4. UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.5.5-1. [Cell 2 becomes detectable and *t-ServiceStart-r18* is fulfilled on Cell 2, however *t-Service-r17* on Cell 1 is not yet fulfilled].

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 14.2.2.5.5-1. [This time, *t-Service-r17* on Cell 1 is fulfilled].

7. The UE shall start satellite switching on Cell 2. If the UE transmits the uplink PUSCH channel to Cell 2 less than 130 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.

8. After T3 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.

9. Once the connection is released, the SS shall switch off and then on the UE.

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

14.2.2.5.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

FFS

14.2.2.5.5 Test Requirement

Table 14.2.2.5.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access.

Table 14.2.2.5.5-1: Cell-specific test parameters for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

| Parameter | | Unit | Cell 1Note1 | | | Cell 2Note1 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite configurationNote2 | |  | SSC.2 | | N/A | N/A | SSC.2 | |
| BWchannel | | MHz | 10: NPRB,c = 52 | |  |  | 10: NPRB,c = 52 | |
| BWP BW | | MHz | 10: NPRB,c = 52 | |  |  | 10: NPRB,c = 52 | |
| Kmac | | ms | 0 | |  |  | 0 | |
| DRX Cycle | | ms | Not Applicable | |  |  | Not Applicable | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | |  |  | SR.1.1 FDD | |
| CORESET Reference Channel | |  | CR.1.1 FDD | |  |  | CR.1.1 FDD | |
| TRS configuration | |  | TRS.1.1 FDD | |  |  | TRS.1.1 FDD | |
| OCNG Patterns | |  | OP.1 | |  |  | OP.1 | |
| SMTC Configuration | |  | SMTC.1 | |  |  | SMTC.5 | |
| SSB Configuration | |  | SSB.1 FR1 | |  |  | SSB.5 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | |  |  | 15 kHz | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | |  |  | 15 kHz | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | |  |  | N/A | |
| 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/ 15 kHz | -98+TT | | | | | |
| Note2 | | dBm/ SCS | -98+TT | | | | | |
|  | | dB | 4+TT | 4+TT | -Infinity | -Infinity | 9+TT | 9+TT |
|  | | dB | 4+TT | 4+TT | -Infinity | -Infinity | 9+TT | 9+TT |
| SSB\_RP | | dBm/ SCS | -94+TT | -94+TT | -Infinity | -Infinity | -89+TT | -89+TT |
| IoNote3 | | dBm/ 9.36 MHz | -64.59+TT | -64.59+TT | -70.05+TT | -70.05+TT | -60.53+TT | -60.53+TT |
| Propagation condition | | - | AWGN | | | | | |
| NOTE 1: Cell 1 and Cell 2 have same PCI. Satellite serving for Cell 1 and Satellite serving for Cell 2 are two different NGSO satellites.  NOTE 2: SSB transmit timing from TE should fit the SSB-timeOffset and the nominal propagation delay difference between serving satellite and target satellite. The nominal propagation delay is counted from the SSB-TimeOffset reference point to UE, which based on satellite locations and UE location known to the TE in this test case.  NOTE 3: 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 4: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 5: 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 14.2.2.5.5-2: Target Satellite configuration pattern for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

|  |  |
| --- | --- |
| Parameter | TSC.2 |
| Interval between adjacent epoch time | 2.56 s |
| ntn-UlSyncValidityDuration | 5 s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |
| ssb-TimeOffset | 10 |
| t-ServiceStart | T2 |

The UE shall start to transmit the PUSCH to Cell 2 less than 130 ms from the beginning of time period T2.

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

NOTE: The satellite switch with re-sync delay Dswitch\_unchangedPCI can be expressed as: Tsoft\_switch, where:

Tsoft\_switch = max(*t-service*-*t-seviceStart*, Tsearch + T∆ + Tmargin) + TIU + Tprocessing ms

Here: *t-service*-*t-seviceStart=* 100ms*;* Tsearch = 10.5ms; T∆ = 20ms; Tmargin = 2ms, Tprocessing = 10ms.

Besides, interruption uncertainty TIU = 20ms in acquiring the first configured grant based PUSCH transmission resource is needed.

This gives a total of 130 ms.

## 14.3 Timing for Satellite Access

### 14.3.1 UE transmit timing for Satellite Access

#### 14.3.1.0 Minimum conformance requirements

The UE shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. UE initial transmit timing accuracy and gradual timing adjustment requirements are defined in the following requirements.

The normative reference for this requirement is TS.38.133 [6] clause 7.1C.1.

14.3.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to ±Te\_NTN where the timing error limit value Te\_NTN is specified in Table 14.3.1.0.1-1. This requirement applies:

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

The UE shall meet the Te\_NTN 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 path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at the UE antenna.

*N*TA for PRACH is defined as 0. (in *T*c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. or after the last update in or .

The value of *N*TA-offset depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). *N*TA-offset is defined in TS 38.133 [6] Table 7.1.2-2.

and are as defined in TS 38.211 [7].

Table 14.3.1.0.1-1: Te\_NTN Timing Error Limit

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | Te\_NTN |
| 1 | 15 | 15 | 29\*64\*Tc |
|  |  | 30 | 24\*64\*Tc |
|  |  | 60 | N/A |
|  | 30 | 15 | 24\*64\*Tc |
|  |  | 30 | 22\*64\*Tc |
|  |  | 60 | N/A |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

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, the updating of and the updating of , except when the timing advance in TS 38.133 [6] clause 7.3C is applied.

The normative reference for this requirement is TS.38.133 [6] clause 7.1C.2.

14.3.1.0.2 Minimum conformance requirements for gradual timing adjustment

When the transmission timing error between the UE and the reference timing exceeds ±Te\_NTN then the UE shall adjust the timing such that timing error is to within ±Te\_NTN. 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, apart from a change of due to satellite position update and between the previous transmission and the current transmission, in one adjustment shall be Tq\_NTN.

2) The minimum aggregate adjustment rate, apart from a change of due to satellite position update and during the last one second, shall be Tp\_NTN per second.

3) The maximum aggregate adjustment rate, apart from a change of due to satellite position update and during the last 200ms, shall be Tq\_NTN per 200 ms.

Where, the maximum autonomous time adjustment step Tq\_NTN and the aggregate adjustment rate Tp\_NTN are specified in Table 14.3.1.0.2-1.

**Table 14.3.1.0.2-1: Tq\_NTN Maximum Autonomous Time Adjustment Step and Tp\_NTN Minimum Aggregate Adjustment rate**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of uplink signals (kHz)** | **Tq\_NTN** | **Tp\_NTN** |
| 1 | 15 | 5.5\*64\*Tc | 5.5\*64\*Tc |
|  | 30 | 5.5\*64\*Tc | 5.5\*64\*Tc |
|  | 60 | N/A | N/A |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1C.2.1

#### 14.3.1.1 NR SA FR1 UE transmit timing accuracy for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Call setup and test procedure needs to be updated
* Applicability may need to be updated
* Exceptions to connection diagram may need to be updated
* Several sections are in brackets
* Several test parameters and configuration are still in brackets
* Whether GNSS is used and its config is FFS

14.3.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the reference cell 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 clauses 14.3.1.0.1 and 14.3.1.0.2. Supported test configurations are shown in Table 14.3.1.1.4.1-1.

14.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access. Test 2 requires support of long DRX cycle.

14.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.3.1.0.1 and 14.3.1.0.2.

The normative reference for this requirement is 38.133 [6] clause A.14.3.1.1

14.3.1.1.4 Test Description

The test consists of a single NR cell (PCell). Table 14.3.1.1.5-1 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table 14.3.1.1.5-2.

14.3.1.1.4.1 Initial Conditions

This test shall be tested in one of the configurations defined in Table 14.3.1.1.4.1-1.

Table 14.3.1.1.4.1-1: Supported test configurations for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.3.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.3.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.3.1.1.4.1-2

Table 14.3.1.1.4.1-2: Initial conditions for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. Message contents are defined in clause 14.3.1.1.4.3.

2. Cell 1 is the NR PCell with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Cell 1 is a satellite access cell].

3. The initial test environment conditions are setup according to section 14.0.5, with the following exceptions:

- For GSO instead of TS 38.508-1 [14] Tables 7.6.2.1-1a and 7.6.2.1-1b, use Tables 7.6.2.2-1, 7.6.2.2-3 and 7.6.2.2-5.

- For NGSO (LEO-600) instead of TS 38.508-1 [14] Tables 7.6.2.1-2a and 7.6.2.1-2b, use Tables 7.6.2.2-4 and 7.6.2.2-6.

- For NGSO (LEO-1200) instead of TS 38.508-1 [14] Tables 7.6.2.1-3a and 7.6.2.1-3b, use Table 7.6.2.2-2.

14.3.1.1.4.2 Test procedure

The test consists of a single NR cell (PCell). The downlink timing of the NR Cell 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.

1. Ensure the UE is in [state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5]. Cell 1 is the active cell.

2. Set up NR Cell according to parameters given in Table 14.3.1.1.5-1.

3. The SS shall transmit an *RRCReconfiguration* message configuring the UE with periodic SRS transmissions according to clause 14.3.1.1.4.3. In Test 2, the UE is also configured with DRX configuration according to Table 14.3.1.1.5-2, for Test 1 and Test 2, correspondingly.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. After connection set up with the cell, and before the DL timing adjustment, the test equipment shall verify that the timing of the NR cell is within of the first detected path of DL SSB.

a. The NTA\_offset value (in Tc units) is 25600

b. The value is derived from the higher-layer parameters *TACommon*, *TACommonDrift*, and *TACommonDriftVariation*.

c. The value is computed by the UE based on UE position and serving-satellite-ephemeris-related higher-layers parameters.

d. The values depend on the DL and UL SCS for which the test is being run and are given in Table 14.3.1.1.5-4.

e. The is the margin for the GNSS position definition error considered in the core requirement, which needs to be substracted for the test requirement, due to the usuage of AT commands in the test.

6. The test system shall adjust the timing of the DL path by values given in Table 14.3.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

Table 14.3.1.1.4.2-1: Adjustment Value for NR SA FR1 UE transmit timing accuracy for Satellite Access

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

7. For Test 1, the test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 14.3.1.1.5-5. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity) and checks these against the following rules:

- Rule 1: the SS shall check that the maximum amount of the magnitude of the timing change, apart from a change of due to satellite position update and between the previous transmission and the current transmission, in one adjustment shall be Tq\_NTN, as specified in Table 14.3.1.1.5-5.

- Rule 2: to check that the minimum adjustment rate is within Rule 2 as specified in clause 14.3.1.0.1 and Table 14.3.1.1.5-5, the SS shall measure the change in SRS transmission timing, apart from a change of due to satellite position update and , 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.

- Rule 3: to check that the maximum aggregate adjustment rate is within Rule 3 as specified in clause 14.3.1.0.1 and Table 14.3.1.1.5-5, the SS shall measure the change in SRS transmission timing, apart from a change of due to satellite position update and , 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 Table 14.3.1.1.5-5 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 this test step, where T=DL\_timing\_change[Ts]/[5.5+TT]Ts and DL\_timing\_change is specified in Table 14.3.1.1.4.2-1.

8. Once the UE transmit timing is within the limits specified in step 7, the test system shall verify that the UE transmit timing offset is within of the first detected path of DL SSB (similar to test step 5). For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

9. The SS shall transmit an *RRCRelease* message to release the UE from the NR cell.

14.3.1.1.4.3 Message contents

Editor’s Note: Message contents are FFS

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

Table 14.3.1.1.4.3-0: Common Exception messages for NR SA FR1 UE transmit timing accuracy for Satellite Access

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

Table 14.3.1.1.4.3-1: *SRS-Config* for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | 14 |  |  |
| } |  |  |  |
| groupOrSequenceHopping | neither |  |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| periodicityAndOffset-p CHOICE { |  |  |  |
| sl1 | 0 |  | Test 1 |
| sl320 | 3 |  | Test 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.3.1.1.4.3-2: *DRX-Config* for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
| Information Element | Value/remark | Comment | Condition |
| DRX-Config ::= CHOICE { |  |  |  |
| drx-InactivityTimer | ms1 |  |  |
| drx-RetransmissionTimerDL | sl1 |  |  |
| drx-RetransmissionTimerUL | sl1 |  |  |
| drx-LongCycleStartOffset CHOICE { |  |  |  |
| ms320 | 0 |  |  |
| } |  |  |  |
| } |  |  |  |

14.3.1.1.5 Test Requirements

Tables 14.3.1.1.5-1, 14.3.1.1.5-2, 14.3.1.1.5-3, 14.3.1.1.5-4 and 14.3.1.1.5-5 define the primary level settings including test tolerances for NR SA FR1 UE transmit timing accuracy for Satellite Access.

Table 14.3.1.1.5-1: Cell Specific Test Parameters for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test1 | Test2 |
| SSB ARFCN |  | 1,2 | 1 | 1 |
| Serving satellite configuration |  | 1 | SSC.1 | |
|  | 2 | SSC.2 | |
| BWchannel | MHz | 1,2 | 10: NRB,c = 52 | |
| Initial BWP Configuration |  | 1,2 | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP Configuration |  | 1,2 | DLBWP.1.1  ULBWP.1.1 | |
| DRX Cycle | ms | 1,2 | N/A | DRX.8Note5 |
| PDSCH Reference measurement channel |  | 1,2 | SR.1.1 FDD | |
| RMSI CORESET Reference Channel |  | 1,2 | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel |  | 1,2 | CCR.1.1 FDD | |
| OCNG Patterns |  | 1,2 | OP.1 | |
| SSB configuration |  | 1,2 | SSB.1 FR1 | |
| SMTC Configuration |  | 1,2 | SMTC.1 | |
| TRS configuration |  | 1,2 | TRS.1.1 FDD | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |  |
| Note2 | dBm/15 kHz | 1,2 | -98+TT | -98+TT |
| Note2 | dBm/SCS | 1,2 | -98+TT | -98+TT |
|  |  | 1,2 | 3+TT | 3+TT |
|  |  | 1,2 | 3+TT | 3+TT |
| SS-RSRPNote3 | dBm/SCS | 1,2 | -95+TT | -95+TT |
| IoNote3 | dBm/9.36MHz | 1,2 | -65.2+TT | -65.2+TT |
| Propagation condition |  | 1,2 | AWGN | |
| SRS Config |  | 1,2 | SRSConf.1Note6 | SRSConf.2Note6 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: DRX related parameters are given in Table 14.3.1.1.5-3  Note 6: SRS configs are given in Table 14.3.1.1.5-2 | | | | |

**Table 14.3.1.1.5-2: SRS Configuration for NR SA FR1 UE transmit timing accuracy for Satellite Access**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | Comments |
| SRS- | srs-ResourceSetId | 0 | 0 |  |
| ResourceSet | 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 | 14 | 14 | Matches NRB,c |
|  | freqHopping  b-SRS | 0 | 0 |  |
|  | freqHopping  b-hop | 0 | 0 |  |
|  | groupOrSequenceHopping | Neither | Neither |  |
|  | resourceType | Periodic | Periodic |  |
|  | periodicityAndOffset-p | sl1, 0 | sl320, 3 | Offset to align with DRX periodicity |
|  | sequenceId | 0 | 0 | Any 10 bit number |

Table 14.3.1.1.5-3: DRX-Configuration for NR SA FR1 UE transmit timing accuracy for Satellite Access

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

Table 14.3.1.1.5-4: Te Timing Error Limit for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | Te\_NTN |
| 1 | 15 | 15 | (29+TT)\*64\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

Table 14.3.1.1.5-5: Tq\_NTN Maximum Autonomous Time Adjustment Step and Tp\_NTN Minimum Aggregate Adjustment rate for NR SA FR1 UE transmit timing accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of uplink signals (kHz) | Tq\_NTN | Tp\_NTN |
| 1 | 15 | (5.5+TT)\*64\*Tc | (5.5+TT)\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [7] | | | |

### 14.3.2 Timing Advance for Satellite Access

#### 14.3.2.0 Minimum conformance requirements

UE shall adjust the timing of its uplink transmission timing from the beginning of uplink time slot *n*+ *k+1+2µ* for a timing advance command received in time slot *n*, and the value of *k, µ* and are defined in clause 4.2 in TS 38.213 [8]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

The normative reference for this requirement is TS 38.133 [6] clause 7.3C.2.1.

14.3.2.0.1 Minimum conformance requirements for UE Timing Advance adjustment accuracy

The UE shall adjust the timing of its transmissions, apart from a change of and between the preceding uplink transmission and the current transmission, with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 14.3.2.0.1-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

Table 14.3.2.0.1-1: UE Timing Advance adjustment accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| UL Sub Carrier Spacing(kHz) | 15 | 30 | 60 |
| UE Timing Advance adjustment accuracy | ±256 Tc | ±256 Tc | N/A |

The normative reference for this requirement is TS 38.133 [6] clause 7.3C.2.2

#### 14.3.2.1 NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete

- Message contents are FFS

14.3.2.1.1 Test purpose

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 14.3.2.0.

14.3.2.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.3.2.0.1 and 14.3.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.3.2.1

14.3.2.1.4 Test Description

In all test cases, single cell served by SAN is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table 14.3.2.1.5-2, 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.

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

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in Table 14.3.2.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

The UE shall adjust its uplink timing at slot n+k*+1+2µ* for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

14.3.2.1.4.1 Initial Conditions

This test shall be tested in one of the configurations defined in Table 14.3.2.1.4.1-1.

Table 14.3.2.1.4.1-1: Supported test configurations for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.3.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.3.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.3.2.1.4.1-2

Table 14.3.2.1.4.1-2: Initial conditions for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. Message contents are defined in clause 14.3.2.1.4.3.

2. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is a satellite access cell.

3. The initial test environment conditions are setup according to section 14.0.5.

Table 14.3.2.1.4.1-3: General test parameters for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF channel number |  | 1 |  |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | For 15 kHz SCS *NTA\_new = NTA\_old + 8192\*Tc*  (based on equation in clause 4.2 of TS 38.213 [8]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

14.3.2.1.4.2 Test procedure

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

1. Ensure the UE is in [state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5]. Cell 1 is the active cell.

2. Set up NR Cell according to parameters given in Table 14.3.2.1.5-1.

3. The SS shall transmit an *RRCReconfiguration* message configuring the UE with periodic SRS transmissions according to clause 14.3.2.1.4.3.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element with value set to 31. This results in zero adjustment of the Timing Advance, and therefore establishes a reference value for the timing advance used by the UE. T2 starts once T1 expires.

6. During time period T2, the test equipment shall send Timing Advance command MAC Control Elements, with a Timing Advance value of 39 as specified in table 14.3.2.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

7. The UE shall adjust its uplink timing at slot *n*+ *k+1+2µ* for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

8. The result from the SRS and adjustment of the timing advance in step 7) is used to measure whether the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 14.3.2.1.5-3 to the signalled timing advance value compared to the timing of preceding uplink transmission. If the UE adjusts its timing within the requirement, the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. 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.

10. After the RRC connection is released, the SS shall switch OFF and then ON the UE to proceed with the next iteration.

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

14.3.2.1.4.3 Message contents

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

Table 14.3.2.1.4.3-0: Common Exception messages for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

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

Table 14.3.2.1.4.3-1: *SRS-Config* for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | 12 |  |  |
| } |  |  |  |
| groupOrSequenceHopping | neither |  |  |
| resourceType CHOICE { |  |  |  |
| periodic SEQUENCE { |  |  |  |
| periodicityAndOffset-p CHOICE { |  |  |  |
| sl5 | 2 | Once every 5 slots |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.3.2.1.5 Test Requirements

Tables 14.3.2.1.5-1 and 14.3.2.1.5-2 define the primary level settings including test tolerances for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access.

Table 14.3.2.1.5-1: Cell Specific Test Parameters for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test1 | |
|  | | |  | T1 | T2 |
| Duplex mode | | Config 1,2 |  | FDD | |
| Satellite information | | Config 1 |  | SSC.1 | |
|  | | Config 2 |  | SSC.2 | |
| BWchannel | | Config 1,2 | MHz | 10: NRB,c = 52 | |
| BWP BW | | Config 1,2 | MHz | 10: NRB,c = 52 | |
| DRX Cycle | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | Config 1,2 |  | SR.1.1 FDD | |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | | Config 1,2 |  | CCR.1.1 FDD | |
| TRS configuration | | Config 1,2 |  | TRS.1.1 FDD | |
| OCNG Patterns | | |  | OCNG pattern 1 | |
| SMTC configuration | | Config 1,2 |  | SMTC.1 FR1 | |
| SSB configuration | | Config 1,2 |  | SSB.1 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |
| Note2 | | | dBm/15kHz | -98+TT | |
| Note2 | Config 1,2 | | dBm/SCS | -98+TT | |
|  | | | dB | 3+TT | |
|  | | | dB | 3+TT | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -67.57+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. | | | | | |

**Table 14.3.2.1.5-2: SRS Configuration for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| Field | | Value | Comment |
| c-SRS | Config 1,2 | 12 | 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=2 for SCS 15kHz | 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]. | | | |

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k*+1+2µ* slots after the reception of the timing advance command, where k=5.

The Timing Advance adjustment accuracy shall be within the limits specified in Table 14.3.2.1.5-3.

Table 14.3.2.1.5-3: UE Timing Advance adjustment accuracy for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

|  |  |
| --- | --- |
| Sub Carrier Spacing, SCS kHz | 15 |
| UE Timing Advance adjustment accuracy | ±256+TT Tc |

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

## 14.4 Signalling characteristics

### 14.4.1 Radio link monitoring for Satellite Access

#### 14.4.1.0 General

The requirements in this clause apply for radio link monitoring on PCell and the UE is configured with only PCell, which is served by satellite access node (SAN).The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

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

The threshold Qout is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate (BLERout) as defined in Table 14.4.1.0-1. For SSB based radio link monitoring, Qout\_SSB is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.1-1. For CSI-RS based radio link monitoring, Qout\_CSI-RS is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.2-1.

The threshold Qin is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at Qout and shall correspond to the in-sync block error rate (BLERin) as defined in Table 14.4.1.0-1. For SSB based radio link monitoring, Qin\_SSB is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.1-2. For CSI-RS based radio link monitoring, Qin\_CSI-RS is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.2-2.

The out-of-sync block error rate (BLERout) and in-sync block error rate (BLERin) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 14.4.1.0-1 by default. All requirements in this clause are applicable for BLER Configuration #0 in Table 14.4.1.0-1.

Table 14.4.1.0-1: Out-of-sync and in-sync block error rates

|  |  |  |
| --- | --- | --- |
| Configuration | BLERout | BLERin |
| 0 | 10% | 2% |

UE shall be able to monitor up to NRLM RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number  of SSBs per half frame according to TS 38.213 [8], where NRLM is specified in Table 14.4.1.0-2 according TS 38.213 [8], and meet the requirements as specified in this clause. UE is not required to meet the requirements in this clause if RLM-RS is not configured and no TCI state for PDCCH is activated.

Table 14.4.1.0-2: Maximum number of RLM-RS resources NRLM

|  |  |  |
| --- | --- | --- |
| Carrier frequency range of PCell |  | Maximum number of RLM-RS resources, NRLM |
| FR1, ≤ 3 GHzNote | 4 | 2 |
| FR1, > 3 GHzNote | 8 | 4 |
| NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 1.88GHz, as specified in clause 4.1 in TS 38.213 [8]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.1.

##### 14.4.1.0.1 Minimum conformance requirements for SSB based Radio Link Monitoring for Satellite Access

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 14.4.1.0.1.

Table 14.4.1.0.1-1: PDCCH transmission parameters for out-of-sync evaluation

|  |  |
| --- | --- |
| Attribute | Value for BLER Configuration #0 |
| 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 | 4dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

Table 14.4.1.0.1-2: PDCCH transmission parameters for in-sync evaluation

|  |  |
| --- | --- |
| Attribute | Value for BLER Configuration #0 |
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

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

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

TEvaluate\_out\_SSB and TEvaluate\_in\_SSB are defined in Table 14.4.1.0.1-1 for FR1.

P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

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

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

Table 14.4.1.0.1-1: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms) | TEvaluate\_in\_SSB (ms) |
| no DRX | Max(200, Ceil(10  P)  TSSB) | Max(100, Ceil(5  P)  TSSB) |
| DRX cycle≤320ms | Max(200, Ceil(15  P)  Max(TDRX,TSSB)) | Max(100, Ceil(7.5  P)  Max(TDRX,TSSB)) |
| DRX cycle>320ms | Ceil(10  P)  TDRX | Ceil(5  P)  TDRX |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. TDRX is the DRX cycle length. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.2.1 and 8.1C.2.2.

14.4.1.0.1.1 Measurement restrictions for SSB based RLM for Satellite Access

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

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;

- If SSB and CSI-RS have different SCS,

- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;

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

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.2.3.

##### 14.4.1.0.2 Minimum conformance requirements for CSI-RS based Radio Link Monitoring for Satellite Access

The requirements in this clause apply for each CSI-RS based RLM-RS resource configured for PCell, provided that the CSI-RS configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 14.4.1.0.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

Table 14.4.1.0.2-1: PDCCH transmission parameters for out-of-sync evaluation

|  |  |
| --- | --- |
| Attribute | Value for BLER Configuration #0 |
| 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 | 4dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 4dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

Table 14.4.1.0.2-2: PDCCH transmission parameters for in-sync evaluation

|  |  |
| --- | --- |
| Attribute | Value for BLER Configuration #0 |
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

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

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

- TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS are defined in Table 14.4.1.0.2-1 for FR1.

The requirements of TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements do not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

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

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

The values of Mout and Min used in Table 14.4.1.0.2-1 are defined as:

- Mout = 20 and Min = 10, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth ≥ 24 PRBs.

Table 14.4.1.0.2-1: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms) | TEvaluate\_in\_CSI-RS (ms) |
| no DRX | Max(200, Ceil(Mout×P)×TCSI-RS) | Max(100, Ceil(Min×P) × TCSI-RS) |
| DRX ≤ 320ms | Max(200, Ceil(1.5×Mout×P)× Max(TDRX, TCSI-RS)) | Max(100, Ceil(1.5×Min×P)× Max(TDRX, TCSI-RS)) |
| DRX > 320ms | Ceil(Mout×P) × TDRX | Ceil(Min×P) × TDRX |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10ms, 20 ms or 40 ms. TDRX is the DRX cycle length. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.3.1 and 8.1C.3.2.

14.4.1.0.2.1 Measurement restrictions for SSB based RLM for Satellite Access

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

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

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.3.3.

#### 14.4.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.1.1 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 SAN PCell when no DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.4.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.1.

14.4.1.1.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.1.4.1-1. The test parameters are given in Tables 14.4.1.1.4.1-3, 14.4.1.1.5-1, and 14.4.1.1.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.1.4-1 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. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.



Figure 14.4.1.1.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

14.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.1.4.1-1.

Table 14.4.1.1.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.1.1.4.1-2.

Table 14.4.1.1.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.1.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.1.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| BWchannel | | Config 1, 2 | MHz | 10: NRB,c = 52 |
| 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 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.1.3 FDD |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 15 kHz |
| PRACH Configuration | | Config 1, 2 |  | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | *gp0* |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 2 |  | CSI-RS.1.1 FDD |
| CSI-RS for tracking | | Config 1, 2 |  | TRS.1.1 FDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

14.4.1.1.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.1.4.1-3.

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. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.1.5-1. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.1.5-1.

9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.1.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| 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, 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 = 0  Table H.3.1-6 with conditions gapUE and RLM  Table H.3.1-8 with Condition SSB RLM  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 14.4.1.1.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

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

14.4.1.1.5 Test Requirement

Table 14.4.1.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access.

Table 14.4.1.1.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
|  | Config 2 |  | 1.8 | -6.2 | -15.8 |
|  | Config 1 | dBm/15kHz | -98 | | |
|  | Config 2 |  | -98 | | |
|  | Config 1 | dBm/SCS | -98 | | |
|  | Config 2 |  | -98 | | |
| Propagation condition | |  | NTN-TDLC5-200 | | |
| 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 in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 14.4.1.1.4-1. | | | | | |

Table 14.4.1.1.5-2: Measurement gap configuration for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| *gapOffset* | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 | |

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%.

#### 14.4.1.2 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.2.1 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 SAN PCell when no DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.4.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.2.

14.4.1.2.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.2.4.1-1. The test parameters are given in Tables 14.4.1.2.4.1-3 and 14.4.1.2.5-1 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.2.4-1 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.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

A diagram of a diagram

Description automatically generated

Figure 14.4.1.2.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

14.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.2.4.1-1.

Table 14.4.1.2.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.1.2.4.1-2.

Table 14.4.1.2.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.2.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

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

14.4.1.2.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.2.4.1-3.

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. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.2.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.2.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.2.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.2.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.2.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition L3 FILTERING NEEDED  Table H.3.1-3 with Condition RLM  Table H.3.1-8 with Condition SSB RLM  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 14.4.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

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

14.4.1.2.5 Test Requirement

Table 14.4.1.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access.

Table 14.4.1.2.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 2 |  | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1 | dBm/15 kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 1 | dBm/SCS | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
| Propagation condition | |  | NTN-TDLC5-200 | | | | |
| 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 in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 14.4.1.2.4-1. | | | | | | | |

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%.

#### 14.4.1.3 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.3.1 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 SAN PCell when DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX.

14.4.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.3.

14.4.1.3.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.3.4.1-1. The test parameters are given in Tables 14.4.1.3.4.1-3, 14.4.1.3.5-1, and 14.4.1.3.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.3.4-1 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.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.



Figure 14.4.1.3.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

14.4.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.3.4.1-1.

Table 14.4.1.3.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.1.3.4.1-2.

Table 14.4.1.3.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.3.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.3.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| BWchannel | | Config 1, 2 | MHz | 10: NRB,c = 52 |
| 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 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.1.3 FDD |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 15 kHz |
| PRACH Configuration | | Config 1, 2 |  | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 2 |  | CSI-RS.1.1 FDD |
| CSI-RS for tracking | | Config 1, 2 |  | TRS.1.1 FDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.68 |
| T3 | | | s | 0.68 |
| D1 | | | s | 0.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

14.4.1.3.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.3.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

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

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting and DRX according to section 14.4.1.3.4.3.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.3.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.3.5-1. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.3.5-1.

9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.3.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition L3 FILTERING NEEDED,  Table H.3.1-3 with Condition RLM  Table H.3.1-8 with Condition SSB RLM  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 14.4.1.3.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

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

14.4.1.3.5 Test Requirement

Table 14.4.1.3.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access.

Table 14.4.1.3.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
|  | Config 2 |  | 1.8 | -6.2 | -15.8 |
|  | Config 1 | dBm/15kHz | -98 | | |
|  | Config 2 |  | -98 | | |
|  | Config 1 | dBm/SCS | -98 | | |
|  | Config 2 |  | -98 | | |
| Propagation condition | |  | NTN-TDLC5-200 | | |
| 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 in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 14.4.1.3.4-1. | | | | | |

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%.

#### 14.4.1.4 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.4.1 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 SAN PCell when DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX.

14.4.1.4.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.4.

14.4.1.4.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.4.4.1-1. The test parameters are given in Tables 14.4.1.4.4.1-3 and 14.4.1.4.5-1 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.4.4-1 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.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

A diagram of a diagram

Description automatically generated

Figure 14.4.1.4.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

14.4.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.4.4.1-1.

Table 14.4.1.4.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.1.4.4.1-2.

Table 14.4.1.4.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.4.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.4.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.4.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Value |
|  | | | |  | Test 1 |
| Active PCell | | | |  | Cell 1 |
| RF Channel Number | | | |  | 1 |
| BWchannel | | | Config 1, 2 | MHz | 10: NRB,c = 52 |
| 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 |
| RMSI CORESET Reference Channel | | | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | | Config 1, 2 |  | CCR.1.1 FDD |
| SSB Configuration | | | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2 |  | 15 kHz |
| PRACH Configuration | | | Config 1, 2 |  | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | |  | 0 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| In sync transmission parameters | DCI format | | |  | 1-0 |
|  | Number of Control OFDM symbols | | |  | 2 |
|  | Aggregation level | | | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 0 |
|  | DMRS precoder granularity | | |  | REG bundle size |
|  | REG bundle size | | |  | 6 |
| Out of sync transmission parameters | DCI format | | |  | 1-0 |
|  | Number of Control OFDM symbols | | |  | 2 |
|  | Aggregation level | | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 4 |
|  | DMRS precoder granularity | | |  | REG bundle size |
|  | REG bundle size | | |  | 6 |
| DRX | | | |  | DRX.3 |
| Gap pattern ID | | | |  | N.A. |
| Layer 3 filtering | | | |  | *Enabled* |
| T310 timer | | | | ms | 2000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 2 | |  | CSI-RS.1.1 FDD |
| CSI-RS for tracking | | Config 1, 2 | |  | TRS.1.1 FDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.24 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| D1 | | | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

14.4.1.4.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.4.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

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

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting and DRX according to section 14.4.1.4.4.3.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.4.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.4.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.4.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.4.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.4.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.4.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition L3 FILTERING NEEDED  Table H.3.1-3 with Condition RLM  Table H.3.1-8 with Condition SSB RLM  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 14.4.1.4.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms2000 |  |  |
| n310 | n1 |  |  |
| t311 | ms1000 |  |  |
| n311 | n1 |  |  |
| } |  |  |  |

14.4.1.4.5 Test Requirement

Table 14.4.1.4.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access.

Table 14.4.1.4.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 2 |  | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1 | dBm/15 kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 1 | dBm/SCS | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
| Propagation condition | |  | NTN-TDLC5-200 | | | | |
| 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 in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 14.4.1.4.4-1. | | | | | | | |

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%.

#### 14.4.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.5.1 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 CSI-RS based radio link quality of the SAN PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and CSI-RS based RLM.

14.4.1.5.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.5.

14.4.1.5.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.5.4.1-1. The test parameters are given in Tables 14.4.1.5.4.1-3, 14.4.1.5.5-1, and 14.4.1.5.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.5.4-1 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 not enabled. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.



Figure 14.4.1.5.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

14.4.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.5.4.1-1.

Table 14.4.1.5.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.5-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.5-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.5.4.1-2.

**Table 14.4.1.5.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.5.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.5.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.5.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Satellite information | Config 1 |  | SSC.1 |
|  | Config 2 |  | SSC.2 |
| Duplex mode | Config 1, 2 |  | FDD |
| 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 |
| RMSI CORESET Reference Channel | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 |  | CCR.1.3 FDD |
| SSB Configuration | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
| TRS configuration | Config 1, 2 |  | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | *gp0* |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 |  | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

14.4.1.5.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.5.4.1-3.

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. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.5.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.5.5-1. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.5.5-1.

9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.5.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.5.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| 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, 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 = 0  Table H.3.1-6 with conditions gapUE and RLM  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.1.5.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

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

14.4.1.5.5 Test Requirement

Table 14.4.1.5.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access.

Table 14.4.1.5.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 |
|  | Config 1, 2 | dBm/15kHz | -98 | | |
| Propagation condition | |  | NTN-TDLC5-200 | | |
| 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 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.1.5.4-1. | | | | | |

Table 14.4.1.5.5-2: Measurement gap configuration for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| *gapOffset* | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 | |

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%.

#### 14.4.1.6 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.6.1 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 CSI-RS based radio link quality of the SAN PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and CSI-RS based RLM.

14.4.1.6.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.6.

14.4.1.6.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.6.4.1-1. The test parameters are given in Tables 14.4.1.6.4.1-3 and 14.4.1.6.5-1 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.6.4-1 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. In the test, DRX configuration is not enabled. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

A diagram of a diagram

Description automatically generated

Figure 14.4.1.6.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

14.4.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.6.4.1-1.

Table 14.4.1.6.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 14.4.1.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.6.4.1-2.

Table 14.4.1.6.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.6.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.6.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.6.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Satellite information | Config 1 |  | SSC.1 |
|  | Config 2 |  | SSC.2 |
| Duplex mode | Config 1, 2 |  | FDD |
| 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 |
| RMSI CORESET Reference Channel | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 |  | CCR.1.1 FDD |
| SSB Configuration | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
| TRS configuration | Config 1, 2 |  | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 |  | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | S | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

14.4.1.6.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.6.4.1-3.

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. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.6.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.6.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.6.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.6.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.6.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.6.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.6.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition L3 FILTERING NEEDED,  Table H.3.1-3 with Condition RLM  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.1.6.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

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

14.4.1.6.5 Test Requirement

Table 14.4.1.6.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access.

**Table 14.4.1.6.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1, 2 | dBm/15kHz | -98 | | | | |
| Propagation condition | |  | NTN-TDLC5-200 | | | | |
| 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, SNR3, SNR4 and SNR5 respectively in figure 14.4.1.6.4-1. | | | | | | | |

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%.

#### 14.4.1.7 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.7.1 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 CSI-RS based radio link quality of the SAN PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, CSI-RS based RLM and long DRX.

14.4.1.7.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.7.

14.4.1.7.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.7.4.1-1. The test parameters are given in Tables 14.4.1.7.4.1-3, 14.4.1.7.5-1, and 14.4.1.7.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.7.4-1 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.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.



Figure 14.4.1.7.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

14.4.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.7.4.1-1.

Table 14.4.1.7.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.7-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.7-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.7.4.1-2.

Table 14.4.1.7.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.7.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.7.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.1.7.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Satellite information | Config 1 |  | SSC.1 |
|  | Config 2 |  | SSC.2 |
| Duplex mode | Config 1, 2 |  | FDD |
| 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 |
| RMSI CORESET Reference Channel | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 |  | CCR.1.3 FDD |
| SSB Configuration | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
| TRS configuration | Config 1, 2 |  | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 |  | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

14.4.1.7.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.7.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

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

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting and DRX according to section 14.4.1.7.4.3.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.7.5-1. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.7.5-1.

9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.7.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.7.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition L3 FILTERING NEEDED  Table H.3.1-3 with Condition RLM  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM  Table H.3.7-1 with condition DRX.3  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.1.7.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

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

14.4.1.7.5 Test Requirement

Table 14.4.1.7.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access.

Table 14.4.1.7.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 |
|  | Config 1, 2 | dBm/15kHz | -98 | | |
| Propagation condition | |  | NTN-TDLC5-200 | | |
| 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 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.1.7.4-1. | | | | | |

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%.

#### 14.4.1.8 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

* Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

14.4.1.8.1 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 CSI-RS based radio link quality of the SAN PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

14.4.1.8.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, CSI-RS based RLM and long DRX.

14.4.1.8.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.8.

14.4.1.8.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in Table 14.4.1.8.4.1-1. The test parameters are given in Tables 14.4.1.8.4.1-3, 14.4.1.8.5-1 and 14.4.1.8.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.8.4-1 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. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

A diagram of a diagram

Description automatically generated

Figure 14.4.1.8.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

14.4.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.8.4.1-1.

Table 14.4.1.8.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.1.8-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.8-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.8.4.1-2.

Table 14.4.1.8.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.1.8.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.1.8.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.8.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Satellite information | Config 1 |  | SSC.1 |
|  | Config 2 |  | SSC.2 |
| Duplex mode | Config 1, 2 |  | FDD |
| 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 |
| RMSI CORESET Reference Channel | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 |  | CCR.1.1 FDD |
| SSB Configuration | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
| TRS configuration | Config 1, 2 |  | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | gp0 |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 |  | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.24 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

14.4.1.8.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.8.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

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

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern, periodic CSI reporting and DRX according to section 14.4.1.8.4.3.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.8.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.8.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.8.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.8.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

14.4.1.8.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 14.4.1.8.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| 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, 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 = 0  Table H.3.1-6 with conditions gapUE and RLM  Table H.3.1-8 with Condition CSI-RS RLM  Table H.3.5-4  Table H.3.5-9 with Condition CSI-RS RLM  Table H.3.7-1 with condition DRX.3  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.1.8.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms2000 |  |  |
| n310 | n1 |  |  |
| t311 | ms1000 |  |  |
| n311 | n1 |  |  |
| } |  |  |  |

14.4.1.8.5 Test Requirement

Table 14.4.1.8.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access.

Table 14.4.1.8.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
|  | Config 1, 2 | dBm/15kHz | -98 | | | | |
| Propagation condition | |  | NTN-TDLC5-200 | | | | |
| 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, SNR3, SNR4 and SNR5 respectively in figure 14.4.1.8.4-1. | | | | | | | |

Table 14.4.1.8.5-2: Measurement gap configuration for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| *gapOffset* | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 | |

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%.

### 14.4.2 Beam Failure Detection and Link recovery procedures for satellite access

#### 14.4.2.00 General

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set  as specified in TS 38.213 [8] in order to detect beam failure on PCell and the UE is configured with only PCell, which is served by satellite access node (SAN).

The RS resource configurations in the set  on PCell can be periodic CSI-RS resources and/or SSBs.

On each RS resource configuration in the set , the UE shall estimate the radio link quality and compare it to the threshold Qout\_LR for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold Qout\_LR is defined as the level at which the downlink radio level link of a given resource configuration on set  cannot be reliably received and shall correspond to the BLERout = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, Qout\_LR\_SSB is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.2.0.1-1. For CSI-RS based beam failure detection, Qout\_LR\_CSI-RS is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.2.0.3-1.

Upon request the UE shall deliver configuration indexes from the set as specified in TS 38.213 [8] , to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold Qin\_LR, which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the Qin\_LR threshold to the L1-RSRP measurement obtained from an SSB. The UE applies the Qin\_LR threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter *powerControlOffsetSS*. The RS resource configurations in the set  can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.1.

#### 14.4.2.0 Minimum conformance requirements

##### 14.4.2.0.1 Minimum conformance requitements for SSB based beam failure detection

[TS 38.133, clause 8.5C.2.1]

The requirements in this clause apply for each SSB resource in the set  configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in this clause.

Table 14.4.2.0.1-1: PDCCH transmission parameters for beam failure instance

|  |  |
| --- | --- |
| Attribute | Value for BLER |
| 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 | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.5C.2.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set  estimated over the last TEvaluate\_BFD\_SSB ms period becomes worse than the threshold Qout\_LR\_SSB within TEvaluate\_BFD\_SSB ms period.

The value of TEvaluate\_BFD\_SSB is defined in Table 14.4.2.0.1-2 for FR1.

P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

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

For an FR1serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

Table 14.4.2.0.1-2: Evaluation period TEvaluate\_BFD\_SSB for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_BFD\_SSB (ms) |
| no DRX | Max(50, Ceil(5 ´ P) ´ TSSB) |
| DRX cycle ≤ 320ms | Max(50, Ceil(7.5 ´ P) ´ Max(TDRX,TSSB)) |
| DRX cycle > 320ms | Ceil(5 ´ P) ´ TDRX |
| Note: TSSB is the periodicity of SSB in the set . TDRX is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.2.

##### 14.4.2.0.2 Measurement restriction for SSB based beam failure detection

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following scenarios.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;

- If SSB and CSI-RS have different SCS,

- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;

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

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.2.3.

##### 14.4.2.0.3 Minimum conformance requitements for CSI-RS based beam failure detection

[TS 38.133, clause 8.5C.3.1]

The requirements in this clause apply for each CSI-RS resource in the set  of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in this clause. UE is not expected to perform beam failure detection measurements on the CSI-RS configured for BFD if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP.

Table 14.4.2.0.3-1: PDCCH transmission parameters for beam failure instance

|  |  |
| --- | --- |
| Attribute | Value for BLER |
| 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 | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.5C.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set  estimated over the last TEvaluate\_BFD\_CSI-RS ms period becomes worse than the threshold Qout\_LR\_CSI-RS within TEvaluate\_BFD\_CSI-RS ms period.

The value of TEvaluate\_BFD\_CSI-RS is defined in Table 14.4.2.0.3-1 for FR1.

The requirements of TEvaluate\_BFD\_CSI-RS apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

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

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

The values of MBFD used in Table 14.4.2.0.3-2 are defined as

- MBFD = 10, if the CSI-RS resource(s) in set  used for BFD is transmitted with Density = 3 and over the bandwidth ≥ 24 PRBs.

The values of PBFD used in Table 14.4.2.0.3-2 are defined as

For each CSI-RS resource in the set  configured for PCell SA

- PBFD = 1.

Table 14.4.2.0.3-2: Evaluation period TEvaluate\_BFD\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_BFD\_CSI-RS (ms) |
| no DRX | Max(50, Ceil(MBFD ´ P ´ PBFD) ´ TCSI-RS) |
| DRX cycle ≤ 320ms | Max(50, Ceil(1.5 × MBFD ´ P ´ PBFD) ´ Max(TDRX, TCSI-RS)) |
| DRX cycle > 320ms | Ceil(MBFD ´ P ´ PBFD) ´ TDRX |
| Note: TCSI-RS is the periodicity of CSI-RS resource in the set . TDRX is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.3.2.

##### 14.4.2.0.4 Measurement restriction for CSI-RS based beam failure detection

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

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

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.3.3.

##### 14.4.2.0.5 Minimum requirement for L1 indication

When the radio link quality on all the RS resources in set  is worse than Qout\_LR, layer 1 of the UE shall send a beam failure instance indication to the higher layers

The beam failure instance evaluation for the RS resources in set  shall be performed as specified in clause 6 in TS 38.213 [8]. Two successive indications from layer 1 shall be separated by at least TIndication\_interval\_BFD.

When DRX is not used, TIndication\_interval\_BFD is max(2ms, TSSB-RS,M) ) or max(2ms, TCSI-RS,M), where TSSB-RS,M and TCSI-RS,M is the shortest periodicity of all RS resources in set  for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set  or CSI-RS resource in the set .

When DRX is used, for SSB based link quality measurement,

- TIndication\_interval\_BFD = Max(1.5 × DRX\_cycle\_length, 1.5 × TSSB-RS,M), if DRX\_cycle\_length ≤ 320ms,

- TIndication\_interval\_BFD = DRX\_cycle\_length, if DRX\_cycle\_length > 320ms.

When DRX is used, for CSI-RS based link quality measurement,

- TIndication\_interval\_BFD = Max(1.5 × DRX\_cycle\_length, 1.5 × TCSI-RS,M), if DRX\_cycle\_length ≤ 320ms,

- TIndication\_interval\_BFD = DRX\_cycle\_length, if DRX\_cycle\_length > 320ms.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.4.

##### 14.4.2.0.6 Minimum conformance requitements for SSB based candidate beam detection

[TS 38.133, clause 8.5C.5.1]

The requirements in this clause apply for each SSB resource in the set  configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

[TS 38.133, clause 8.5C.5.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set  estimated over the last TEvaluate\_CBD\_SSB ms period becomes better than the threshold Qin\_LR provided SSB\_RP and SSB Ês/Iot are according to Annex Table B.2.19.1 of TS 38.133 [6] for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 14.4.2.0.6-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of TEvaluate\_CBD\_SSB is defined in Table 14.4.2.0.6-1 for FR1.

where,

P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

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

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

The values of PCBD used in Table 14.4.2.0.6-1 are defined as

For each SSB resource in the set  configured for PCell.

- PCBD = 1.

Table 14.4.2.0.6-1: Evaluation period TEvaluate\_CBD\_SSB for FR1

|  |  |
| --- | --- |
| **Configuration** | **TEvaluate\_CBD\_SSB (ms)** |
| non-DRX, DRX cycle ≤ 320ms | Max(25, Ceil(3 ´ P ´ PCBD) ´ TSSB) |
| DRX cycle > 320ms | Ceil(3 ´ P ´ PCBD) ´ TDRX |
| Note: TSSB is the periodicity of SSB in the set . TDRX is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.5.2.

##### 14.4.2.0.7 Measurement restriction for SSB based candidate beam detection

For FR1, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for CBD measurement without any restrictions;

- If SSB and CSI-RS have different SCS-es,

- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for CBD measurement without any restriction;

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

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.5.3.

##### 14.4.2.0.8 Minimum conformance requitements for CSI-RS based candidate beam detection

[TS 38.133, clause 8.5C.6.1]

The requirements in this clause apply for each CSI-RS resource in the set  configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

[TS 38.133, clause 8.5C.6.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set  estimated over the last TEvaluate\_CBD\_CSI-RS [ms] period becomes better than the threshold Qin\_LR within TEvaluate\_CBD\_CSI-RS [ms] period provided CSI-RS Ês/Iot is according to Annex Table B.2.19.2 of TS 38.133 [6] for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in table 14.4.2.0.8-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of TEvaluate\_CBD\_CSI-RS is defined in Table 14.4.2.0.8-1 for FR1.

P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

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

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

The values of MCBD used in Table 14.4.2.0.8-1 are defined as

- MCBD = 3, if the CSI-RS resource configured in the set  is transmitted with Density = 3 and over the bandwidth ≥ 24 PRBs.

The values of PCBD used in Table 8.5C.6.2-1 are defined as

For each CSI-RS resource in the set  configured for SA

- PCBD = 1.

Table 14.4.2.0.8-1: Evaluation period TEvaluate\_CBD\_CSI-RS for FR1

|  |  |
| --- | --- |
| **Configuration** | **TEvaluateC\_CBD\_CSI-RS (ms)** |
| non-DRX, DRX cycle ≤ 320ms | Max(25, Ceil(MCBD ´ P ´ PCBD) ´ TCSI-RS) |
| DRX cycle > 320ms | Ceil(MCBD ´ P ´ PCBD) ´ TDRX |
| Note: TCSI-RS is the periodicity of CSI-RS resource in the set . TDRX is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.6.2.

##### 14.4.2.0.9 Measurement restriction for CSI-RS based candidate beam detection

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

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.6.3.

#### 14.4.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access

Editor’s note: This test tolerance analysis is incomplete. The following aspects are missing:

- The accuracy requirement for L1-RSRP are in [ ] in TS 38.133 and not yet finalised

- The results of the TT analysis are provisional until the corresponding uncertainty requirement values are agreed

14.4.2.1.1 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 which is served by satellite access node (SAN) and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

14.4.2.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.1.

14.4.2.1.4 Test description

The test parameters are given in Tables 14.4.2.1.4.1-1, 14.4.2.1.4.1-3 and 14.4.2.1.5-1 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 14.4.2.1.4-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure 14.4.2.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.



Figure 14.4.2.1.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

14.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.1.4.1-1.

Table 14.4.2.1.4.1-1: Supported test configurations for FR1 Pcell

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.2.1.4.1-2.

Table 14.4.2.1.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.2.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.2.1.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.2.1.4.1-3: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| NTN reference Serving satellite configuration | | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Active PSCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Duplex mode | | Config 1,2 |  | FDD |  |
| BWchannel | | Config 1,2 | MHz | 10: NRB,c = 52 |  |
| 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 |  |
| TDD Configuration | | Config 1,2 |  | Not Applicable |  |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | | Config 1,2 |  | CCR.1.1 FDD |  |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 |  |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 |  | 15 KHz |  |
| PRACH Configuration | | Config 1,2 |  | PRACH.2 FR1 |  |
| SSB Index assigned as BFD RS (q0) | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | |  | 1 |  |
| OCNG parameters | | |  | OP.1 |  |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format |  | 1-0 |  |
|  | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average 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 |  |
| DRX | | |  | OFF |  |
| Gap pattern ID | | |  | gp0 |  |
| gapOffset | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  |  |  |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | |  | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | | Config 1,2 |  | CSI-RS.1.1 FDD |  |
| CSI-RS for tracking | | Config 1,2 |  | TRS.1.1 FDD |  |
| SSB Index assigned as RLM RS | |  |  | 0, 1 |  |
| T310 Timer | |  | ms | 1000 |  |
| N310 | |  |  | 2 |  |
| T1 | | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 0.37 |  |
| T3 | | | s | 0.24 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 0.17 |  |
| D1 | | | s | 0.13 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

14.4.2.1.4.2 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 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* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.1.5-1. 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 14.4.2.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.1.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. 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 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

14.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition “Short\_DCI” with the following exceptions:

Table 14.4.2.1.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-6 with Condition BFD  Table H.3.1-1  Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, 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 = 0  Table H.3.1-8 with Condition SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A  Table H.3.5-4  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.2.1.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 4 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.2.1.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 14.4.2.1.4.3-4: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 14.4.2.1.4.3-5: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

Table 14.4.2.1.4.3-6: PDCCH *Search Space* for USS

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 2 |  |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n1 |  |  |
| aggregationLevel4 | n1 |  |  |
| aggregationLevel8 | n0 |  |  |
| } |  |  |  |
| } |  |  |  |

14.4.2.1.5 Test requirements

Tables 14.4.2.1.4.1-3 and 14.4.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX.

Table 14.4.2.1.5-1: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1,2 | dB | 5.4 | -2.6 | -12.4 | -12.4 | -12.4 |
| SNR\_SSB of set q1 | Config 1,2 | dB | -10.1 | -10.1 | 10.1 | 10.1 | 10.1 |
| SSB\_RP of set q1 | Config 1,2 | dBm/SCS kHz | -108.1 | -108.1 | -87.9 | -87.9 | -87.9 |
|  | Config 1,2 | dBm/15 KHz | -98 | | | | |
| 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 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 14.4.2.1.4-1.  Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 is -15dB-TT = -15.4dB (including test tolerances). | | | | | | | |

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 130 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 14.4.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access

Editor’s note: This test tolerance analysis is incomplete. The following aspects are missing:

- The accuracy requirement for L1-RSRP are in [ ] in TS 38.133 and not yet finalised

- The results of the TT analysis are provisional until the corresponding uncertainty requirement values are agreed

14.4.2.2.1 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 which is served by satellite access node (SAN) and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

14.4.2.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.2.

14.4.2.2.4 Test description

The test parameters are given in Tables 14.4.2.2.4.1-1, 14.4.2.2.4.1-3 and 14.4.2.2.5-1 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 14.4.2.2.4-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure 14.4.2.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.



Figure 14.4.2.2.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in DRX mode

14.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.2.4.1-1.

Table 14.4.2.2.4.1-1: Supported test configurations for FR1 Pcell

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.2.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.2.2.4.1-2.

Table 14.4.2.2.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.2.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.2.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.2.2.4.1-3: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| NTN reference Serving satellite configuration | | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Active PSCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Duplex mode | | Config 1,2 |  | FDD |  |
| BWchannel | | Config 1,2 | MHz | 10: NRB,c = 52 |  |
| 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 |  |
| TDD Configuration | | Config 1,2 |  | Not Applicable |  |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | | Config 1,2 |  | CCR.1.1 FDD |  |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 |  |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 |  | 15 KHz |  |
| PRACH Configuration | | Config 1,2 |  | PRACH.2 FR1 |  |
| SSB Index assigned as BFD RS (q0) | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | |  | 1 |  |
| OCNG parameters | | |  | OP.1 |  |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format |  | 1-0 |  |
|  | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average 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 |  |
| DRX | | |  | DRX.7 | Table A.5-1 |
| Gap pattern ID | | |  | N.A. |  |
| gapOffset | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  |  |  |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | |  | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | | Config 1,2 |  | CSI-RS.1.1 FDD |  |
| CSI-RS for tracking | | Config 1,2 |  | TRS.1.1 FDD |  |
| SSB Index assigned as RLM RS | |  |  | 0, 1 |  |
| T310 Timer | |  | ms | 1000 |  |
| N310 | |  |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 5.17 |  |
| T3 | | | s | 3.24 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 1.97 |  |
| D1 | | | s | 1.93 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

14.4.2.1.4.2 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 with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. 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.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.2.5-1. 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 14.4.2.2.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.2.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.2.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.2.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. 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 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

14.4.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition “Short\_DCI” with the following exceptions:

Table 14.4.2.2.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery 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 SSB BFD  Table H.3.1-10 with Condition SSB  Table H.3.1-10A  Table H.3.5-4  Table H.3.7-1 with Condition DRX.7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.2.2.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 4 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.2.2.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 14.4.2.2.4.3-4: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 14.4.2.2.4.3-5: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

Table 14.4.2.2.4.3-6: PDCCH *Search Space* for USS

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 2 |  |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n1 |  |  |
| aggregationLevel4 | n1 |  |  |
| aggregationLevel8 | n0 |  |  |
| } |  |  |  |
| } |  |  |  |

14.4.2.2.5 Test requirements

Tables 14.4.2.2.4.1-3 and 14.4.2.2.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

Table 14.4.2.2.5-1: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1,2 | dB | 5.4 | -2.6 | -12.4 | -12.4 | -12.4 |
| SNR\_SSB of set q1 | Config 1,2 | dB | -10.1 | -10.1 | 10.1 | 10.1 | 10.1 |
| SSB\_RP of set q1 | Config 1,2 | dBm/SCS kHz | -108.1 | -108.1 | -87.9 | -87.9 | -87.9 |
|  | Config 1,2 | dBm/15 KHz | -98 | | | | |
| 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 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 14.4.2.2.4-1.  Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 is -15dB-TT = -15.4dB (including test tolerances). | | | | | | | |

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 14.4.2.3 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access

Editor’s note: This test tolerance analysis is incomplete. The following aspects are missing:

- The accuracy requirement for L1-RSRP are in [ ] in TS 38.133 and not yet finalised

- The results of the TT analysis are provisional until the corresponding uncertainty requirement values are agreed

14.4.2.3.1 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 which is served by satellite access node (SAN) 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, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

14.4.2.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.4.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.3.

14.4.2.3.4 Test description

The test parameters are given in Tables 14.4.2.3.4.1-1, 14.4.2.3.4.1-3 and 14.4.2.3.5-1 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 14.4.2.3.4-1 shows the variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure. Figure 14.4.2.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.



Figure 14.4.2.3.4-1: SNR and L1-RSRP variation CSI-RS for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

14.4.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.3.4.1-1.

Table 14.4.2.3.4.1-1: Supported test configurations for FR1 Pcell

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.2.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.2.3.4.1-2.

Table 14.4.2.3.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.2.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.2.3.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.2.3.4.1-3: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| NTN reference Serving satellite configuration | | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Active PSCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Duplex mode | | Config 1,2 |  | FDD |  |
| TDD Configuration | | Config 1,2 |  | Not Applicable |  |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | | Config 1,2 |  | CCR.1.1 FDD |  |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 |  |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 |  | 15 KHz |  |
| PRACH Configuration | | Config 1,2 |  | PRACH.4 FR1 |  |
| SSB Index assigned as BFD RS (q0) | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | |  | 1 |  |
| OCNG parameters | | |  | OP.1 |  |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format |  | 1-0 |  |
|  | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average 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 |  |
| DRX | | |  | OFF |  |
| Gap pattern ID | | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  |  |  |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | |  | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for q0 and q1 | | Config 1,2 |  | CSI-RS.1.2 FDD |  |
| CSI-RS configuration for CSI reporting | | Config 1,2 |  | CSI-RS.1.1 FDD |  |
| TRS configuration | | Config 1,2 |  | TRS.1.1 FDD |  |
| CSI-RS-Index assigned as RLM RS | | Config 1,2 |  | CSI-RS.1.2 FDD |  |
| T310 Timer | |  | ms | 1000 |  |
| N310 | |  |  | 2 |  |
| T1 | | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 0.18 |  |
| T3 | | | s | 0.14 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 0.08 |  |
| D1 | | | s | 0.04 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

14.4.2.3.4.2 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.

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. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.3.5-1. 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 14.4.2.3.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.3.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.3.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.3.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. 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 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

14.4.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition “Short\_DCI” with the following exceptions:

Table 14.4.2.3.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery 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.3.1-10 with Condition CSI-RS  Table H.3.1-10A  Table H.3.5-4  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.2.3.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 4 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.2.3.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 14.4.2.3.4.3-4: *NZP-CSI-RS-Resource*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
| Information Element | Value/remark | Comment | Condition |
| NZP-CSI-RS-Resource ::= SEQUENCE { |  |  |  |
| powerControlOffsetSS | db0 |  |  |
| } |  |  |  |

Table 14.4.2.3.4.3-5: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 14.4.2.3.4.3-6: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

14.4.2.3.5 Test requirements

Tables 14.4.2.3.4.1-3 and 14.4.2.3.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 14.4.2.3.5-1: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1,2 | dB | 5.4 | -2.6 | -12.4 | -12.4 | -12.4 |
| SNR\_CSI-RS of set q1 | Config 1,2 | dB | -10.1 | -10.1 | 10.1 | 10.1 | 10.1 |
| CSI-RS\_RP of set q1 | Config 1,2 | dBm/SCS kHz | -108.1 | -108.1 | -87.9 | -87.9 | -87.9 |
|  | Config 1,2 | dBm/15 KHz | -98 | | | | |
| 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 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 14.4.2.3.4-1.  Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 is -15dB-TT = -15.4dB (including test tolerances). | | | | | | | |

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 40 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### 14.4.2.4 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access

Editor’s note: This test tolerance analysis is incomplete. The following aspects are missing:

- The accuracy requirement for L1-RSRP are in [ ] in TS 38.133 and not yet finalised

- The results of the TT analysis are provisional until the corresponding uncertainty requirement values are agreed

14.4.2.4.1 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 which is served by satellite access node (SAN) 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, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

14.4.2.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.4.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.4.

14.4.2.4.4 Test description

The test parameters are given in Tables 14.4.2.4.4.1-1, 14.4.2.4.4.1-3 and 14.4.2.4.5-1 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 14.4.2.4.4-1 shows the variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure. Figure 14.4.2.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.



Figure 14.4.2.4.4-1: SNR and L1-RSRP variation CSI-RS for CSI-RS-based beam failure detection and link recovery testing in DRX mode

14.4.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.4.4.1-1.

Table 14.4.2.4.4.1-1: Supported test configurations for FR1 Pcell

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.2.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.2.4.4.1-2.

Table 14.4.2.4.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.4.2.4.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.2.4.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.4.2.4.4.1-3: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| NTN reference Serving satellite configuration | | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Active PSCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Duplex mode | | Config 1,2 |  | FDD |  |
| TDD Configuration | | Config 1,2 |  | Not Applicable |  |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | | Config 1,2 |  | CCR.1.1 FDD |  |
| SSB Configuration | | Config 1,2 |  | SSB.3 FR1 |  |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 |  | 15 KHz |  |
| PRACH Configuration | | Config 1,2 |  | PRACH.4 FR1 |  |
| SSB Index assigned as BFD RS (q0) | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | |  | 1 |  |
| OCNG parameters | | |  | OP.1 |  |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format |  | 1-0 |  |
|  | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average 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 |  |
| DRX | | |  | DRX.7 |  |
| Gap pattern ID | | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  |  |  |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | |  | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for q0 and q1 | | Config 1,2 |  | CSI-RS.1.2 FDD |  |
| CSI-RS configuration for CSI reporting | | Config 1,2 |  | CSI-RS.1.1 FDD |  |
| TRS configuration | | Config 1,2 |  | TRS.1.1 FDD |  |
| CSI-RS-Index assigned as RLM RS | | Config 1,2 |  | CSI-RS.1.2 FDD |  |
| T310 Timer | |  | ms | 1000 |  |
| N310 | |  |  | 2 |  |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 8.37 |  |
| T3 | | | s | 6.44 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 1.97 |  |
| D1 | | | s | 1.93 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

14.4.2.4.4.2 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 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.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.4.5-1. 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 14.4.2.4.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.4.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.4.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.4.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. 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 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

14.4.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition “Short\_DCI” with the following exceptions:

Table 14.4.2.4.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery 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.3.1-10 with Condition CSI-RS  Table H.3.1-10A  Table H.3.5-4  Table H.3.7-1 with Condition DRX.7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.4.2.4.4.3-2: PDCCH *Search Space* for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
| Information Element | Value/remark | Comment | Condition |
| SearchSpace ::= SEQUENCE { |  |  |  |
| searchSpaceId | 4 | BFR |  |
| controlResourceSetId | 2 | BFR |  |
| monitoringSlotPeriodicityAndOffset CHOICE { |  |  |  |
| sl1 | NULL |  |  |
| } |  |  |  |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 |  |
| nrofCandidates SEQUENCE { |  |  |  |
| aggregationLevel1 | n0 |  |  |
| aggregationLevel2 | n0 |  |  |
| aggregationLevel4 | n0 |  |  |
| aggregationLevel8 | n1 | AL8 |  |
| aggregationLevel16 | n0 |  |  |
| } |  |  |  |
| searchSpaceType CHOICE { |  |  |  |
| ue-Specific SEQUENCE { |  |  | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1\_0 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.2.4.4.3-3: *RLF-TimersAndConstants*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| n310 | n2 |  |  |
| } |  |  |  |

Table 14.4.2.4.4.3-4: *NZP-CSI-RS-Resource*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
| Information Element | Value/remark | Comment | Condition |
| NZP-CSI-RS-Resource ::= SEQUENCE { |  |  |  |
| powerControlOffsetSS | db0 |  |  |
| } |  |  |  |

Table 14.4.2.4.4.3-5: *PDCCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { |  |  |  |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries |  |  |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR |  |
| } |  |  |  |
| controlResourceSetToReleaseList | Not present |  |  |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries |  |  |
| SearchSpace[2] | SearchSpace | entry 2, BFR |  |
| } |  |  |  |
| searchSpacesToReleaseList | Not present |  |  |
| downlinkPreemption | Not present |  |  |
| tpc-PUSCH | Not present |  |  |
| tpc-PUCCH | Not present |  |  |
| tpc-SRS | Not present |  |  |
| } |  |  |  |

Table 14.4.2.4.4.3-6: ControlResourceSet for BFR

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
| Information Element | Value/remark | Comment | Condition |
| ControlResourceSet ::= SEQUENCE { |  |  |  |
| controlResourceSetId | 2 |  |  |
| duration | 2 |  |  |
| cce-REG-MappingType CHOICE { |  |  |  |
| interleaved ::= SEQUENCE { |  |  |  |
| reg-BundleSize | n6 |  |  |
| interleaverSize | n2 |  |  |
| shiftIndex | 0 |  |  |
| } |  |  |  |
| tci-StatesPDCCH-ToAddList | Not present |  |  |
| } |  |  |  |

14.4.2.4.5 Test requirements

Tables 14.4.2.4.4.1-3 and 14.4.2.4.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 14.4.2.4.5-1: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1,2 | dB | 5.4 | -2.6 | -12.4 | -12.4 | -12.4 |
| SNR\_CSI-RS of set q1 | Config 1,2 | dB | -10.1 | -10.1 | 10.1 | 10.1 | 10.1 |
| CSI-RS\_RP of set q1 | Config 1,2 | dBm/SCS kHz | -108.1 | -108.1 | -87.9 | -87.9 | -87.9 |
|  | Config 1,2 | dBm/15 KHz | -98 | | | | |
| 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 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 14.4.2.3.4-1.  Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 is -15dB-TT = -15.4dB (including test tolerances). | | | | | | | |

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### 14.4.3 Active BWP Switch for SAN

#### 14.4.3.1 DCI-based and Timer-based Active BWP Switch

##### 14.4.3.1.0 Minimum conformance requirements

14.4.3.1.0.1 Minimum conformance requirements for DCI-based and timer-based active BWP switch

The requirements in this clause apply for a UE configured with only PCell, which is served by satellite access node (SAN). The requirements in this clause also apply for a UE configured with more than one BWP on PCell.

UE shall complete the switch of active DL and/or UL BWP within the delay defined in this clause.

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with more than one BWP configurations configured.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of TBWPswitchDelay + Y which starts from the beginning of DL slot n. Where,

- Y=0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.

- Y equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario, TBWPswitchDelay + Y shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of TBWPswitchDelay which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of TBWPswitchDelay which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration TBWPswitchDelay after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in Table 14.4.3.1.0.1-1.

Table 14.4.3.1.0.1-1: BWP switch delay

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length | BWP switch delay TBWPswitchDelay (slots) | |
|  | (ms) | Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| Note 1: Depends on UE capability.  Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] clause 8.10C in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] clause 8.10C in the new BWP.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within the time duration of

- TdormantBWPswitchDelay =TBWPswitchDelay+ X, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or

- TdormantBWPswitchDelay =TBWPswitchDelay + X + Z, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where

- TBWPswitchDelay is defined in Table 14.4.3.1.0.1-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.

- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

For DCI-based BWP switch, if the new BWP is a dormant BWP, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive CSI-RS (for DL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL slot occurs right after a time duration of TdormantBWPswitchDelay which starts from the beginning of DL slot n.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6C.2.

##### 14.4.3.1.1 NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Message contents may need to be updated
* Several test parameters and configuration are still FFS

14.4.3.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 14.4.3.1.0.1.

14.4.3.1.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and satellite access.

14.4.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.3.1.1.

14.4.3.1.1.4 Test description

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1’s slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1’s DL slot (*i+TBWPswitchDelay*) as defined in clause 14.4.3.1.0 and starts to report valid ACK/NACK for the Cell1 no later than the first UL slot that occurs after the beginning of slot (). The UE shall be continuously scheduled on Cell1’s BWP-2 starting from the first DL slot that occurs after the beginning of slot (*i+TBWPswitchDelay*).

During T2, the test equipment won’t transmit DCI format for PDSCH reception on Cell1.

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1’s slot (*j+TBWPswitchDelay*) as defined in clause 14.4.3.1.0 and starts to report valid ACK/NACK for the Cell1 at latest on the first UL slot that occurs after the beginning of slot (). The UE shall be continuously scheduled on Cell1’s BWP-1 starting from the first DL slot that occurs after the beginning of slot (*j+TBWPswitchDelay*).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

14.4.3.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.3.1.1.4.1-1.

Table 14.4.3.1.1.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.3.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.3.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.3.1.1.4.1-2.

Table 14.4.3.1.1.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.4.3.1.1.4.1-3.

2. Message contents are defined in clause 14.4.3.1.1.4.3.

3. The test scenario comprises of one satellite access NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

5. By step 4 of the test procedure:

- UE is connected to Cell 1 on radio channel 1.

- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1.

- UE is configured with a *bwp-InactivityTimer* timer value for Cell 1.

Table 14.4.3.1.1.4.1-3: General test parameters for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active Cell |  | Cell 1 | Cell 1 on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| *bwp-InactivityTimer* | ms | 200 |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

14.4.3.1.1.4.2 Test procedure

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

The Cell 1 has constant signal levels throughout 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.

2. Set the parameters according to Tables 14.4.3.1.1.4.1-3 and 14.4.3.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 14.4.3.1.1.4.3-2. UE is configured with a bwp-InactivityTimer timer value for PCell.

4. The SS shall send a DCI format 1\_1 command for Cell 1 DL BWP switch.

5. The UE shall receive the DCI format 1\_1 command in slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

If the UE starts to report valid ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot (), the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

6. If the UE sends valid ACK/NACK for the Cell 1 on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on Cell 1.

7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1:

If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (), the number of successful tests is increased by one, otherwise, the number of failure tests is increased by one. The SS shall switch off and then on the UE.

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

The SS verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

If all subtests pass, the test passes. If one subtest fails, the test fails.

14.4.3.1.1.4.3 Message contents

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

Table 14.4.3.1.1.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |

Table 14.4.3.1.1.4.3-1A: *RRCReconfiguration* (Step 3) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| masterCellGroup | | CellGroupConfig | Table 14.4.3.1.1.4.3-1B |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 14.4.3.1.1.4.3-1B: *CellGroupConfig* (Table 14.4.3.1.1.4.3-1A) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 14.4.3.1.1.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.1.1.4.3-2: *ServingCellConfig* (Table 14.4.3.1.1.4.3-1B) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| initialDownlinkBWP SEQUENCE { |  |  |  |
| pdcch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pdsch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| radioLinkMonitoringConfig CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries |  |  |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1  Table 14.4.3.1.1.4.3-3 |  |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2  Table 14.4.3.1.1.4.3-3 |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 |  |
| bwp-InactivityTimer | ms200 |  |  |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 |  |
| uplinkConfig SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { |  |  |  |
| pucch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pusch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| srs-Config CHOICE { |  |  |  |
| release | NULL |  |  |
|  |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { |  |  |  |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1  Table 14.4.3.1.1.4.3-4 |  |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2  Table 14.4.3.1.1.4.3-4 |  |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.1.1.4.3-3: *BWP-Downlink* (Table 14.4.3.1.1.4.3-2) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Downlink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 | BWP-1 | BWP1 |
|  | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 |  | BWP1 |
|  | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 |  | BWP2 |
| pdsch-ConfigCommon CHOICE { |  |  |  |
| setup | PDSCH-ConfigCommon | Table 14.4.3.1.1.4.3-6 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.1.1.4.3-4: *BWP-Uplink* (Table 14.4.3.1.1.4.3-2) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Uplink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 | BWP-1 | BWP1 |
|  | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
|  | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.1.1.4.3-5: *PDSCH-TimeDomainResourceAllocationList* (Table 14.4.3.1.1.4.3-6) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries |  |  |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { |  | entry 1 |  |
| k0 | Not present |  |  |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { |  | entry 2 |  |
| k0 | Not present |  |  |
| mappingType | typeA |  |  |
| startSymbolAndLength | 72 | S=2, L=6 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { |  | entry 3 |  |
| k0 | TBWPswitchDelay | Defined in Table 14.4.3.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { |  | entry 4 |  |
| k0 | 1 |  | First DCI right after DCI-based BWP switch |
| mappingType | typeA |  |  |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.1.1.4.3-6: *PDSCH-ConfigCommon* (Table 14.4.3.1.1.4.3-3) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-ConfigCommon ::= SEQUENCE { |  |  |  |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 14.4.3.1.1.4.3-5 |  |
| } |  |  |  |

14.4.3.1.1.5 Test requirements

Tables 14.4.3.1.1.4.1-3 and 14.4.3.1.1.5-1 define the primary level settings including test tolerances for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access.

Table 14.4.3.1.1.5-1: NR Cell specific test parameters for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

| Parameter | | | Unit | Cell 1 |
| --- | --- | --- | --- | --- |
| Frequency Range | | |  | FR1 |
| Duplex mode | | Config 1, 2 |  | FDD |
| BWchannel | | Config 1, 2 |  | 10 MHz: NPRB,c = 52 |
| Serving Satellite Configuration | | Config 1, 2 |  | *[SSC.1] or [SSC.2]*  *[NOTE: SSC.1 and SSC.2 are Serving Satellite Configurations for GSO and NGSO, respectively. The selection between the two is up to UE capability, and SSC.2 is selected if DUT supports both]* |
| Active BWP ID | | |  | 1, 2 |
| Initial DL BWP Configuration | | Config 1, 2 |  | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | | Config 1, 2 |  | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | | Config 1, 2 |  | DLBWP.1.3 Note 4 |
| Initial UL BWP Configuration | | Config 1, 2 |  | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | | Config 1, 2 |  | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | | Config 1, 2 |  | N/A |
| PDSCH Reference measurement channel | | Config 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET parameters | | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET parameters | | Config 1, 2 |  | CCR.1.2 FDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | |  | 1x2 Low |
| TRS Configuration | | Config 1, 2 |  | TRS.1.1 FDD |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |
| NocNote 2 | Config 1, 2 | | dBm/SCS | -104+TT |
| NocNote 2 | | | dBm/15 kHz | -104+TT |
| SS-RSRP Note 3 | Config 1, 2 | | dBm/SCS | -87+TT |
| Ês/Iot | | | dB | 17+TT |
| Ês/Noc | | | dB | 17+TT |
| IoNote3 | | Config 1, 2 | dBm/  9.36 MHz | -58.96+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: 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. | | | | |

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ().

During T3, the UE shall start to send the ACK/NACK for 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 TS 38.321 [12].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration *TBWPswitchDelay* defined in Table 14.4.3.1.0.1-1.

All of the above test requirements shall be fulfilled in order for the observed Cell 1 active BWP switch delay to be counted as correct.

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

#### 14.4.3.2 RRC-based Active BWP Switch

##### 14.4.3.2.0 Minimum conformance requirements

14.4.3.2.0.1 Minimum conformance requirements for RRC-based Active BWP switch

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with one or more than one BWP configuration(s) configured, with

* Active BWP switch or parameter change of its active BWPs for PCell

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of slots which begins from the beginning of DL slot n, where

DL slot n is the last slot containing the RRC command, and

is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by on the cell where RRC-based BWP switch occurs. When a longer switching delay is allowed. Where is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.6C.3.

##### 14.4.3.2.1 NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Message contents may need to be updated
* Several test parameters and configuration are still FFS

14.4.3.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 14.4.3.2.0.1.

14.4.3.2.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting BWP adaptation of at least 2 BWPs and satellite access.

14.4.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.3.2.1.

14.4.3.2.1.4 Test description

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell’s slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot () as defined in clause 14.4.3.2.0 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot () on BWP-1 of final condition. The UE shall be continuously scheduled on PCell’s BWP-1 of final condition starting from the first DL slot right after slot ().

TRRCprocessingDelay and TBWPswitchDelayRRC are defined in clause 14.4.3.2.0.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a vaild ACK/NACK is received is received.

14.4.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.3.2.1.4.1-1.

Table 14.4.3.2.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.4.3.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.3.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.3.2.1.4.1-2.

Table 14.4.3.2.1.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.4.3.2.1.4.1-3.

2. Message contents are defined in clause 14.4.3.2.1.4.3.

3. The test scenario comprises of one satellite access NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

5. By step 4 of the test procedure:

- UE is connected to Cell 1 on radio channel 1.

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 of initial condition in Cell 1.

Table 14.4.3.2.1.4.1-3: General test parameters for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |
| T1 | s | 0.2 |  |

14.4.3.2.1.4.2 Test procedure

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Cell 1 has constant signal level throughout 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.

2. Set the parameters according to Tables 14.4.3.2.1.4.1-3 and 14.4.3.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 14.4.3.2.1.5-1.

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

5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for DL BWP switch, change the BWP according to the final condition of Active BWP-1 in Table 14.4.3.2.1.5-1. T1 starts.

6. The UE shall receive the *RRCReconfiguration* in PCell’s slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration.

7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (i + X + k1 ), then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where:

- X = 16 for both test configurations 14.4.3.2.1-1 and 14.4.3.2.1-2.

8. After the SS receives the ACK/NACK in step 7 or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.

9. The SS shall switch off and then on the UE.

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

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

14.4.3.2.1.4.3 Message contents

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

Table 14.4.3.2.1.4.3-1: Common Exception messages for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |

Table 14.4.3.2.1.4.3-1A: *RRCReconfiguration* (1, Step 3, Step 5) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| radioBearerConfig | | Not present |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| masterCellGroup | | CellGroupConfig | Table 14.4.3.2.1.4.3-1B |  |
| dedicatedNAS-MessageList | | Not present |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 14.4.3.2.1.4.3-1B: *CellGroupConfig* (Table 14.4.3.2.1.4.3-1A) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 14.4.3.2.1.4.3-1C |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.2.1.4.3-1C: *ServingCellConfig* (Table 14.4.3.2.1.4.3-1B) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| initialDownlinkBWP SEQUENCE { |  |  |  |
| pdcch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pdsch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| radioLinkMonitoringConfig CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry |  |  |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1  Table 14.4.3.2.1.4.3-1D |  |
| } |  |  |  |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 |  |
| defaultDownlinkBWP-Id | 1 | BWP-1 |  |
| uplinkConfig SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { |  |  |  |
| pucch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| pusch-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
| srs-Config CHOICE { |  |  |  |
| release | NULL |  |  |
| } |  |  |  |
|  |  |  |  |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry |  |  |
| BWP-Uplink[1] | BWP-Uplink | entry 1  Table 14.4.3.2.1.4.3-1E |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | 1 | BWP-1 |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.2.1.4.3-1D: *BWP-Downlink* (Table 14.4.3.2.1.4.3-1C) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Downlink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 |  | Step 3 |
|  | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 |  | Step 5 |
| } |  |  |  |
| } |  |  |  |

Table 14.4.3.2.1.4.3-1E: *BWP-Uplink* (Table 14.4.3.2.1.4.3-1C) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-Uplink ::= SEQUENCE { |  |  |  |
| bwp-Id | 1 |  |  |
| bwp-Common SEQUENCE { |  |  |  |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 |  | Step 3 |
|  | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 |  | Step 5 |
| } |  |  |  |
| } |  |  |  |

14.4.3.2.1.5 Test requirements

Tables 14.4.3.2.1.4.1-3 and 14.4.3.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access.

Table 14.4.3.2.1.5-1: NR Cell specific test parameters for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

| Parameter | | | Unit | Cell 1 |
| --- | --- | --- | --- | --- |
| Frequency Range | | |  | FR1 |
| Duplex mode | | Config 1, 2 |  | FDD |
| BWchannel | | Config 1, 2 |  | 10 MHz: NPRB,c = 52 |
| Serving Satellite Configuration | | Config 1, 2 |  | *[SSC.1] or [SSC.2]*  *[NOTE: SSC.1 and SSC.2 are Serving Satellite Configurations for GSO and NGSO, respectively. The selection between the two is up to UE capability, and SSC.2 is selected if DUT supports both]* |
| Active BWP ID | | |  | 1 |
| Initial DL BWP Configuration | | Config 1, 2 |  | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1, 2 |  | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1, 2 |  | DLBWP.1.3 |
|  | Active UL BWP-1 Configuration | Config 1, 2 |  | ULBWP.1.3 |
| Final  Condition | Active DL BWP-1 Configuration | Config 1, 2 |  | DLBWP.1.1 |
|  | Active UL BWP-1 Configuration | Config 1, 2 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET parameters | | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET parameters | | Config 1, 2 |  | CCR.1.2 FDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | | |  | SMTC.1 |
| TRS Configuration | | Config 1, 2 |  | TRS.1.1 FDD |
| Antenna Configuration | | |  | 1x2 Low |
| Propagation Condition | | |  | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | |  |  |
| NocNote 2 | | Config 1, 2 | dBm/SCS | -104+TT |
| SS-RSRP Note 3 | | Config 1, 2 | dBm/SCS | -87+TT |
| Ês/Iot | | | dB | 17+TT |
| Ês/Noc | | | dB | 17+TT |
| IoNote3 | | Config 1, 2 | dBm/  9.36 MHz | -58.96+TT |
| 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. | | | | |

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot () and starts to report valid ACK/NACK for 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 TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

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

### 14.4.4 UE specific CBW change for SAN

#### 14.4.4.0 Minimum conformance requirements

14.4.4.0.1 Minimum conformance requirements for UE specific CBW change for SAN

The requirements in this clause apply for a UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on an active DL BWP or transmit PUSCH on an active UL BWP of the new CBW right after a time duration of slots which begins from the beginning of DL slot n, where

DL slot n is the last slot containing the RRC command, and

is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331 [13], and

is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration on the cell where UE-specific CBW change occurs. When a longer switching delay is allowed. Where is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.13C.

#### 14.4.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

* MU and TT analysis is incomplete
* Several test parameters and configuration are still FFS

14.4.4.1.1 Test purpose

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 14.4.4.0.1.

14.4.4.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting satellite access.

14.4.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.4.1.

14.4.4.1.4 Test description

The test scenario comprises of one Cell, PCell (Cell 1), which has constant signal levels throughout the test. The test consists of 1 time period with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* containing *SCS-SpecificCarrier* with updated UE specific CBW, sent from the test equipment to the UE, is completely received at the UE side in PCell’s slot # denoted *i*. The UE shall reconfigure its UE specific CBW with the updated CBW-2 for the final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot () as defined in clause 14.4.4.0 and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot () on the PCell’s BWP-1 on CBW-2 for the final condition. The UE shall be continuously scheduled on the PCell’s BWP-1 on CBW-2 for the final condition starting from the first DL slot right after slot ().

and are defined in clause 14.4.4.0.

The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the RRC Reconfiguration message including updated UE specific CBW configuration is sent until the moment a vaild ACK/NACK is received.

14.4.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.4.1.4.1-1.

Table 14.4.4.1.4.1-1: Supported test configurations for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |
| --- | --- |
| 14.4.4.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.4.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.4.4.1.4.1-2.

Table 14.4.4.1.4.1-2: Initial conditions for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.4.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.4.4.1.4.1-3.

2. Message contents are defined in clause 14.4.4.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the satellite access NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

4. The initial test environment conditions are setup according to section 14.0.5.

5. By step 3 of the test procedure:

- UE is connected to Cell 1 (PCell) on radio channel 1.

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 of initial condition in PCell.

- UE has been configured with UE specific CBW (CBW-1).

- UE is indicated in *SCS-SpecificCarrier* [13] that the UE specific CBW is CBW-1 as the initial condition in Cell 1 (PCell).

Table 14.4.4.1.4.1-3: General test parameters for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **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 |  |
| T1 | s | 0.2 |  |

14.4.4.1.4.2 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 Tables 14.4.4.1.4.1-3 and 14.4.4.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1 to ensure that the UE sends ACK/NACK during the test.

4. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

5. T1 starts from the beginning of slot i, where slot i is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 4. The SS shall continuously schedule the PCell’s BWP-1 on CBW-2 starting from the first DL slot right after slot ().

6 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (), then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After the SS receives the ACK/NACK in step 6 or when T1 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. Then the SS shall switch off and then on the UE.

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

14.4.4.1.4.3 Message contents

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

Table 14.4.4.1.4.3-1:*ServingCellConfigCommon* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon::= SEQUENCE { |  |  |  |
| downlinkConfigCommon SEQUENCE { |  |  |  |
| initialDownlinkBWP SEQUENCE { |  |  |  |
| genericParameters | Set according to DLBWP.0.2 |  |  |
| } |  |  |  |
| uplinkConfigCommon SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { | BWP-UplinkCommon |  |  |
| genericParameters | Set according to ULBWP.0.2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.4.1.4.3-2: *ServingCellConfig* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| uplinkConfig SEQUENCE { |  |  |  |
| uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry |  |  |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-UL | Entry 1  Table 14.4.4.1.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry |  |  |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-DL | Entry 1  Table 14.4.4.1.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |

Table 14.4.4.1.4.3-3: *SCS-SpecificCarrier-DL* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
| Information Element | Value/remark | Comment | Condition |
| SCS-SpecificCarrier ::= SEQUENCE { |  |  |  |
| offsetToCarrier | The offset between point A and the lowest PRB index to guarantee the CBW including SSB and CORESET#0 | CBW-1 (DLCBW.1.1) | step 1 |
|  | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in TS 38.508-1[14] clause 4.3.1. | CBW-2 (DLCBW.1.2) | step 4 |
| } |  |  |  |

Table 14.4.4.1.4.3-4: *SCS-SpecificCarrier-UL* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
| Information Element | Value/remark | Comment | Condition |
| SCS-SpecificCarrier ::= SEQUENCE { |  |  |  |
| offsetToCarrier | Any offset within the CBW of test frequency given in TS 38.508-1[14] clause 4.3.1.and different with offsetToCarrier of ULCBW.1.2 | CBW-1 (ULCBW.1.1) | step 1 |
|  | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in TS 38.508-1[14] clause 4.3.1. | CBW-2 (ULCBW.1.2) | step 4 |
| } |  |  |  |

14.4.4.1.5 Test requirement

Tables 14.4.4.1.4.1-3 and 14.4.4.1.5-1 define the primary level settings including test tolerances for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access.

Table 14.4.4.1.5-1: NR Cell specific test parameters for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

| Parameter | | | Unit | Cell 1 |
| --- | --- | --- | --- | --- |
| Frequency Range | | |  | FR1 |
| Duplex mode | | Config 1, 2 |  | FDD |
| BWchannel | | Config 1, 2 |  | 10 MHz: NPRB,c = 52 |
| Serving Satellite Configuration | | Config 1, 2 |  | *[SSC.1] or [SSC.2]*  *[NOTE: SSC.1 and SSC.2 are Serving Satellite Configurations for GSO and NGSO, respectively. The selection between the two is up to UE capability, and SSC.2 is selected if DUT supports both]* |
| Active DL BWP ID | | Config 1, 2 |  | 1 |
| Initial DL BWP Configuration (BWP-1) | | Config 1, 2 |  | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1, 2 |  | ULBWP.0.2 |
| Initial Condition | Active DLCBW-1 Configureation | Config 1, 2 |  | DLCBW.1.1 |
|  | Active UL  CBW-1  Configuration | Config 1, 2 |  | ULCBW.1.1 |
| Final Condition | Active DLCBW-1 Configureation | Config 1, 2 |  | DLCBW.1.2 |
|  | Active UL  CBW-1  Configuration | Config 1, 2 |  | ULCBW.1.2 |
| PDSCH Reference measurement channel | | Config 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET parameters | | Config 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET parameters | | Config 1, 2 |  | CCR.1.1 FDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR1 |
| SMTC Configuration | | |  | SMTC.1 |
| TRS Configuration | | Config 1, 2 |  | TRS.1.1 FDD |
| Antenna Configuration | | |  | 1x2 Low |
| Propagation Condition | | |  | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | |
| NocNote 2 | | Config 1, 2 | dBm/SCS | -104+TT |
| SS-RSRP Note 3 | | Config 1, 2 | dBm/SCS | -87+TT |
| Ês/Iot | | | dB | 17+TT |
| Ês/Noc | | | dB | 17+TT |
| IoNote3 | | Config 1, 2 | dBm/  9.36 MHz | -58.96+TT |
| 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. | | | | |

During T1, the UE shall be ready for the reception of uplink grant for the PCell from the first DL slot that occurs right after the begining of slot () and starts to report valid ACK/NACK for 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 TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed UE specific CBW change delay on the PCell to be counted as correct.

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

## 14.5 Measurement procedure

### 14.5.1 Intra-frequency Measurements for SAN

#### 14.5.1.0 Minimum conformance requirements

##### 14.5.1.0.1 Minimum conformance requitements for intra-frequency measurements without measurement gaps

14.5.1.0.1.1 Intra-frequency cell identification

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.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra) ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 14.5.1.0.1.1-1

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 14.5.1.0.1.1-2

TSSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 14.5.1.0.1.2-1

Kmulti\_SMTC is the scaling factor for measurement of multiple SMTCs or multiple satellites, and

if SMTCs do not overlap with each other,

- , if GEO satellites are measured on the carrier;

- , if LEO satellites are measured on the carrier;

if SMTCs partially overlap with each other,

- , if only GEO satellites are measured on the carrier;

- , if only LEO satellites are measured on the carrier;

where

- is the number of LEO satellites to be measured within i-th SMTC,

- is the number of LEO satellites that UE can measure in parallel within an SMTC,

- is the number of SMTCs that partially overlap with each other.

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, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to CSSFwithin\_gap,i in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

Kp is the scaling factor for an SSB frequency layer to be measured without measurement gaps. Kp = Ntotal\_SAN / Navailable\_SAN, where Navailable\_SAN and Ntotal\_SAN are calculated as follows:

- For a window W of duration max(SMTC period, MGRP\_max), where

- If UE supports *parallelMeasurementGap-r17* and is configured with concurrent measurement gaps, MGRP max is the maximum MGRP across all configured per-UE measurement gap. Otherwise, MGRP max is the MGRP of configured measurement gap.

- Starting from the beginning of any SMTC occasion:

- Ntotal\_SAN is the total number of SMTC occasions within the window, including those overlapped and non-overlapped with measurement gap occasions within the window, and

- Navailable\_SAN is the number of SMTC occasions within the window W that don’t collide with any non-dropped MG occasion within or outside the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] clause 9.1C.8.3. The collision rule between SMTC occasion and measurement gap occasion is defined in TS 38.133 [6] clause 9.1C.9.1

Kp = [1] when Navailable\_SAN = 0 and measurement gap sharing in TS 38.133 [6] clause 9.1.2.1a shall apply.

Kp = 1 when intra-frequency SMTC is fully non overlapping with measurement gaps.

For calculation of Kp, if the high layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1.*

Klayer1\_measurement: it is scaling factor for sharing between L3 and L1 measurement, and Klayer1\_measurement =1, if GEO satellites are measured on the carrier, or if LEO satellites are measured on the carrier and UE supports *parallelMeasurementWithoutRestriction-r17*, otherwise

Klayer1\_measurement =1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, and RSSI symbols are indicated by *SS-RSSI-Measurement*;

Klayer1\_measurement =1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index.

Table 14.5.1.0.1.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max( 600ms, ceil( 5 x Kp x Klayer1\_measurement) x Kmulti\_SMTC x SMTC period )Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5 x Kp x Klayer1\_measurement) x Kmulti\_SMTC x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(5 x Kp x Klayer1\_measurement) x Kmulti\_SMTC 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 14.5.1.0.1.1-2: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, ceil( 3 x Kp x Klayer1\_measurement)x Kmulti\_SMTC x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x Kp x Klayer1\_measurement) x Kmulti\_SMTC x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil(3 x Kp x Klayer1\_measurement) x Kmulti\_SMTC 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 | |

The requirements in clause 14.5.1.0.1.1 and 14.5.1.0.1.2 are not applicable when the overall overhead ratio due to scheduling restriction caused by all configured SMTCs (i.e. scheduling restriction overhead of all SMTCs in one SMTC periodicity), is larger than 75%.

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.1.

14.5.1.0.1.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 14.5.1.0.1.2-1.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for TSSB\_measurement\_period\_intra.

Table 14.5.1.0.1.2-1: Measurement period for intra-frequency measurements without gaps (FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra |
| No DRX | max(200ms, ceil( 5 x Kp x Klayer1\_measurement) x Kmulti\_SMTC x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x Kp x Klayer1\_measurement) x Kmulti\_SMTC x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil( 5 x Kp x Klayer1\_measurement) x Kmulti\_SMTC 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 | |

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.2.

14.5.1.0.1.3 Scheduling availability of UE during intra-frequency measurements

When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged (in TS 38.331 [13]), if it is configured; otherwise, all *L* SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [8] are included.

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.3.

14.5.1.0.1.3.1 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement:

- If *deriveSSB-IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2*is configured (in TS 38.331 [13]), the SMTC periodicityfollows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1.*

- If *deriveSSB-IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2*is configured in TS 38.331 [13], the SMTC periodicityfollows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1.*

The UE shall be able to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and/or the corresponding PDSCH, on SSB symbols to be measured., if the following conditions are met:

- The UE has been notified about system information update through paging,

- The gap between the UE’s reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.3.1.

14.5.1.0.1.3.2 Scheduling availability of UE performing measurements on a neighbor cell served by a different satellite in LEO

For UE which do not support capability *parallelMeasurementWithoutRestriction-r17* the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement on a neighbor cell served by a different satellite in LEO.

- If *deriveSSB-IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2*is configured (in TS 38.331 [13]), the SMTC periodicityfollows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1.*

- If *deriveSSB-IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2*is configured in TS 38.331 [13], the SMTC periodicityfollows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1.*

- If the following conditions are met:

- The UE has been notified about system information update through paging,

- The gap between the UE’s reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

- The UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and/or the corresponding PDSCH, on SSB symbols to be measured.

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.3.2.

##### 14.5.1.0.2 Minimum conformance requitements for intra-frequency measurements with measurement gaps

14.5.1.0.2.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, the 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

Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra ms

Tidentify\_intra\_with\_index = TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 14.5.1.0.2.1-1.

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 14.5.1.0.2.1-2.

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 14.5.1.0.2.2-1.

Kgap is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps. When the UE is configured with concurrent measurement gaps and the two measurement gaps are fully overlapping with MGRP=160ms, Kgap = 2. Otherwise, Kgap = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

For a window W of duration max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, and starting from the beginning of any SMTC occasion:

- Ntotal is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

- Navailable is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3.

Kgap is only applicable for UE supporting *parallelMeasurementGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if Navailable =0, or if one SMTC overlaps more than one MGs associated to the frequency layer.

CSSFintra: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

Kmulti\_SMTC is the scaling factor for measurement of multiple SMTCs or multiple satellites, and

if SMTCs within a measurement gap do not overlap with each other,

- , if GEO satellites are measured on the carrier;

- , if LEO satellites are measured on the carrier;

if SMTCs within a measurement gap partially overlap with each other,

- , if only GEO satellites are measured on the carrier;

- , if only LEO satellites are measured on the carrier;

where

- is the number of LEO satellites to be measured within i-th SMTC,

- is the number of LEO satellites that UE can measure in parallel within an SMTC,

- is the number of SMTCs that partially overlap with each other.

If the higher layer signaling in TS 38.331 [13] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index.

Table 14.5.1.0.2.1-1: Time period for PSS/SSS detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, 5 x Kgap x Kmulti\_SMTC x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x 5) x Kgap x Kmulti\_SMTC x max(MGRP, SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | 5 x Kgap x Kmulti\_SMTC x max(MGRP, DRX cycle) x CSSFintra |

Table 14.5.1.0.2.1-2: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, 3 x Kgap x Kmulti\_SMTC x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil(1.5 x 3) x Kgap x Kmulti\_SMTC x max(MGRP, SMTC period,DRX cycle) x CSSFintra) |
| DRX cycle>320ms | 3 x Kgap x Kmulti\_SMTC x max(MGRP, DRX cycle) x CSSFintra |

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.6.1 and 9.2C.6.2.

14.5.1.0.2.2 Intra-frequency measurement period

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 14.5.1.0.2.2-1.

Table 14.5.1.0.2.2-1: Measurement period for intra-frequency measurements with gaps (FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra |
| No DRX | max(200ms, 5 x Kgap x Kmulti\_SMTC x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x Kmulti\_SMTC x Kgap x max(MGRP, SMTC period,DRX cycle))x CSSFintra |
| DRX cycle>320ms | 5 x Kgap x Kmulti\_SMTC x max(MGRP, DRX cycle) x CSSFintra |

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.6.3.

#### 14.5.1.1 NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access

14.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 14.5.1.0.1.1 and 14.5.1.0.1.2.

14.5.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.1.

14.5.1.1.4 Test description

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 test parameters for PCell and neighbour cell are given in Table 14.5.1.1.4.1-1,14.5.1.1.4.1-3 and 14.5.1.1.5-1 below. 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 UE shall be provided with the valid information about the SAN serving each cell in the test before the start of the test.

UE is configured with 2 non-overlapping SMTCs for the intra-frequency measurement. The SMTC periodicity is 20ms, and SMTC1 is associated with Cell 1 with offset 0, and SMTC2 is associated with Cell 2 with offset 10ms.

14.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.1.4.1-1.

Table 14.5.1.1.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.1.1.4.1-2.

Table 14.5.1.1.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.1.1.4.1-3.

2. Message contents are defined in clause 14.5.1.1.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.1.1.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | Cell 1 |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1 | Cell 1 and Cell 2 |
| SMTC1 configuration |  | 1 | SMTC.1 | Period: 20ms, offset: 0 |
| SMTC2 configuration |  | 2 | SMTC.4 | Period: 20ms, offset: 10ms |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | OFF |  |
| Time offset between serving and neighbour cells | ms | 1, 2 | 10 | Asynchronous cells.  The timing of Cell 2 is 10ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

14.5.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.1.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, and SMTC configuration according to Table 14.5.1.1.4.1-3.

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 14.5.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 802 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

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

14.5.1.1.4.3 Message contents

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

**Table 14.5.1.1.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access**

|  |  |
| --- | --- |
| 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 no GAP NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 (for config 1) or SMTC pattern 4 (for config 2), and Asynchronous cells  Table H.3.1-4 with A3-offset = -4.5 dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ |

14.5.1.1.5 Test requirements

Tables 14.5.1.1.4.1-3 and 14.5.1.1.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access.

Table 14.5.1.1.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS Configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The 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.

#### 14.5.1.2 NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access

Editor's Note:

Test requirements might need to be updated for UEs not reporting maxNumber-NGSO-SatellitesWithinOneSMTC

14.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 14.5.1.0.1.1 and 14.5.1.0.1.2.

14.5.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX cycle.

14.5.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.2.

14.5.1.2.4 Test description

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 test parameters for PCell and neighbour cell are given in Table 14.5.1.2.4.1-1,14.5.1.2.4.1-3 and 14.5.1.2.5-1 below. 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 UE shall be provided with the valid information about the SAN serving for each cell in the test before the start of the test.

UE is configured with 1 SMTC for the intra-frequency measurement. Both Cell 1 and Cell 2 are associated with the configured SMTC.

14.5.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.2.4.1-1.

Table 14.5.1.2.4.1-1: Supported test configurations for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.1.2.4.1-2.

Table 14.5.1.2.4.1-2: Initial conditions for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.1.2.4.1-3.

2. Message contents are defined in clause 14.5.1.2.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.1.2.4.1-3: General test parameters for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| Active cell |  | 1, 2 | Cell 1 | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1 | | Cell 1 and Cell 2 |
| SMTC configuration |  | 1, 2 | SMTC.2 | |  |
| A3-Offset | dB | 1, 2 | -4.5 | |  |
| CP length |  | 1, 2 | Normal | |  |
| Hysteresis | dB | 1, 2 | 0 | |  |
| Time To Trigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | DRX.1 | DRX. 7 |  |
| Time offset between serving and neighbour cells | μs | 1, 2 | 3 | | Synchronous cells |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 5 | 10 |  |

14.5.1.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.1.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, and SMTC configuration according to Table 14.5.1.2.4.1-3.

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 14.5.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than X ms for Test 1, or Y ms for Test 2 then the number of successful tests is increased by one. Where X and Y are defined as:

- For configuration 2, if the UE reports *maxNumber-NGSO-SatellitesWithinOneSMTC* as ‘n1’:

- X = 1282ms

- Y = 12802ms

- Otherwise:

- X = 922ms

- Y = 6402ms

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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

10. Repeat step 1-9 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 14.5.1.2.4.1-3 as appropriate.

14.5.1.2.4.3 Message contents

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

**Table 14.5.1.2.4.3-1: Common Exception messages for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access**

|  |  |
| --- | --- |
| 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 no GAP NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 2, and Synchronous cells  Table H.3.1-4 with A3-offset = -4.5 dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1  Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |

14.5.1.2.5 Test requirements

Tables 14.5.1.2.4.1-3 and 14.5.1.2.5-1 define the primary level settings including test tolerances for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access.

Table 14.5.1.2.5-1: Cell specific test parameters for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

In test 1, 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. The UE is not required to read the neighbour cell SSB index in this test. X=1280 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=920.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than Y ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. Y=12800 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise Y=6400.

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.

#### 14.5.1.3 NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access

Editor's Note:

Test requirements might need to be updated for UEs not reporting maxNumber-NGSO-SatellitesWithinOneSMTC

14.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clauses 14.5.1.0.1.1 and 14.5.1.0.1.2.

14.5.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.5.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.3.

14.5.1.3.4 Test description

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 test parameters for FDD PCell and neighbour cell are given in Table 14.5.1.3.4.1-1 and 14.5.1.3.4.1-3 below. 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 UE shall be provided with the valid information about the SAN serving each cell in the test before the start of the test.

UE is configured with 2 overlapping SMTC for the intra-frequency measurement. The SMTC periodicity is 20ms, and SMTC1 is associated with Cell 1 with offset 0, and SMTC2 is associated with Cell 2 with offset 17ms.

14.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.3.4.1-1.

Table 14.5.1.3.4.1-1: Supported test configurations for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.1.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.1.3.4.1-2.

Table 14.5.1.3.4.1-2: Initial conditions for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.1.3.4.1-3.

2. Message contents are defined in clause 14.5.1.3.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.1.3.4.1-3: General test parameters for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2 | Cell 1 |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1 | Cell 1 and Cell 2 |
| SSB configuration |  | 1, 2 | SSB.1 FR1 |  |
| SMTC1 configuration |  | 1, 2 | SMTC.2 |  |
| SMTC2 configuration |  | 1, 2 | SMTC.6 |  |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 | OFF |  |
| Time offset between serving and neighbour cells | ms | 1, 2 | 3 | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

14.5.1.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 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. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.1.3.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, and SMTC configuration according to Table 14.5.1.3.4.1-3.

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 14.5.1.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than X ms, then the number of successful tests is increased by one. Where X is defined as:

- For configuration 2, if the UE reports *maxNumber-NGSO-SatellitesWithinOneSMTC* as ‘n1’:

- X = 922ms

- Otherwise:

- X = 802ms

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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

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

14.5.1.3.4.3 Message contents

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

**Table 14.5.1.3.4.3-1: Common Exception messages for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access**

|  |  |
| --- | --- |
| 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 no GAP NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 2 (for config 1) or SMTC pattern 6 (for config 2), and Asynchronous cells  Table H.3.1-4 with A3-offset = -4.5 dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ and SSB Index |

14.5.1.3.5 Test requirements

Tables 14.5.1.3.4.1-3 and 14.5.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access.

Table 14.5.1.3.5-1: Cell specific test parameters for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0,1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The 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. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test. X=920 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=800.

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.

#### 14.5.1.4 NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

Editor's Note:

Test requirements might need to be updated for UEs not reporting maxNumber-NGSO-SatellitesWithinOneSMTC

BWP index to be configured needs to be corrected in 38.133 (BWP-0 containing CD-SSB, BWP-1 not containing CD-SSB)

14.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA intra-frequency NR cell search requirements in clause 14.5.1.0.2.

14.5.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and CSI-RS based RLM.

14.5.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.4.

14.5.1.4.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) and a NR FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Tables 14.5.1.4.4.1-1, 14.5.1.4.4.1-3 and 14.5.1.4.5-1 below. 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.

14.5.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.4.4.1-1.

Table 14.5.1.4.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.1.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.1.4.4.1-2.

Table 14.5.1.4.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.1.4.4.1-3.

2. Message contents are defined in clause 14.5.1.4.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.1.4.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | Cell 1 |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1 | Cell 1 and Cell 2 |
| Measurement gap type |  | 1, 2 | Per-UE gaps |  |
| Gap Pattern ID |  | 1, 2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap repetition periodicity | ms | 1, 2 | 40 |  |
| Measurement gap length | ms | 1, 2 | 6 |  |
| Measurement gap offset | ms | 1, 2 | 39 |  |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 | OFF |  |
| Time offset between serving and neighbour cells | ms | 1,2 | 3 | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

14.5.1.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 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.

UE is configured with 1 SMTC for the intra-frequency measurement. Both Cell 1 and Cell 2 are associated with the configured SMTC.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.1.4.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, gap configuration, and SMTC configuration according to Tables 14.5.1.4.4.1-3 and 14.5.1.4.5-1.

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 14.5.1.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than X ms, then the number of successful tests is increased by one. Where X is defined as:

- For configuration 2, if the UE reports *maxNumber-NGSO-SatellitesWithinOneSMTC* as ‘n1’:

- X = 1602ms

- Otherwise:

- X = 1002ms

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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

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

14.5.1.4.4.3 Message contents

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

**Table 14.5.1.4.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

|  |  |
| --- | --- |
| 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 GAP NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 2, and Asynchronous cells  Table H.3.1-4 with A3-offset = -4.5 dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 39  Table H.3.1-7 with Condition INTRA-FREQ and SSB Index |

14.5.1.4.5 Test requirements

Tables 14.5.1.4.4.1-3 and 14.5.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access.

Table 14.5.1.4.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration |  | 1, 2 | SMTC.2 | | SMTC.2 | |
| CSI-RS parameters |  | 1, 2 | CSI-RS.1.2 FDD resource #0 | | N/A | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The 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. The UE is not required to read the neighbour cell SSB index in this test. X=1600 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=1000.

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.

#### 14.5.1.5 NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access

Editor's Note:

Mismatching measurement gap config in 38.133 (Gap pattern ID 1, and mgrp = 40ms) needs to be corrected

SMTC pattern Y needs to be updated

BWP index to be configured needs to be corrected in 38.133 (BWP-0 containing CD-SSB, BWP-1 not containing CD-SSB)

14.5.1.5.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA intra-frequency NR cell search requirements in clause 14.5.1.0.2.

14.5.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]), CSI-RS based RLM and long DRX cycle.

14.5.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.5.

14.5.1.5.4 Test description

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 test parameters for PCell and neighbour cell are given in Tables 14.5.1.5.4.1-1, 14.5.1.5.4.1-3 and 14.5.1.5.5-1 below. 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 UE is configured with 2 concurrent and fully non-overlapping (FNO) measurement gaps for the intra-frequency measurement. Serving Cell 1 is expected to be measured within MeasGapId #0 and Neighbour Cell 2 is expected to be measured within MeasGapId #1.

14.5.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.5.4.1-1.

Table 14.5.1.5.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.1.5-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.5-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.1.5.4.1-2.

Table 14.5.1.5.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.1.5.4.1-3.

2. Message contents are defined in clause 14.5.1.5.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.1.5.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| Active cell |  | 1, 2 | Cell 1 | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1 | | Cell 1 and Cell 2 |
| Measurement gap type |  | 1, 2 | Per-UE gap | |  |
| Gap Pattern ID |  | 1 | [1] | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | |  |
| Measurement gap length | ms | 1, 2 | 6 | |  |
| Measurement gap offset | ms | 1, 2 | 19 for MeasGapId #0  4 for MeasGapId #1 | |  |
| A3-Offset | dB | 1, 2 | -4.5 | |  |
| CP length |  | 1, 2 | Normal | |  |
| Hysteresis | dB | 1, 2 | 0 | |  |
| Time To Trigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | DRX.1 | DRX. 7 |  |
| Time offset between serving and neighbour cells | ms | 1, 2 | 3 | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 5 | 10 |  |

14.5.1.5.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 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.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.1.5.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, two parallel gap configurations, and SMTC configuration according to Tables 14.5.1.5.4.1-3 and 14.5.1.5.5-1.

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 14.5.1.5.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 922 ms for Test 1 or 6402 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

10. Repeat step 1-9 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 14.5.1.5.4.1-3 as appropriate.

14.5.1.5.4.3 Message contents

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

**Table 14.5.1.5.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.7 FR1, [SMTC pattern Y], and Asynchronous cells  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1  Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |

**Table 14.5.1.5.4.3-2: *MeasGapConfig* for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP\_ADD | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { |  |  |  |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries |  |  |
| GapConfig-r17[1] SEQUENCE { |  |  |  |
| measGapId-r17 | 1 | MeasGapId #1 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 19 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms40 | Gap pattern 0 |  |
| mgta-r17 | ms0 |  |  |
| } |  |  |  |
| GapConfig-r17[2] SEQUENCE { |  |  |  |
| measGapId-r17 | 2 | MeasGapId #2 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 4 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms40 | Gap pattern 0 |  |
| mgta-r17 | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.5.1.5.5 Test requirements

Tables 14.5.1.5.4.1-3 and 14.5.1.5.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access.

Table 14.5.1.5.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.7 FR1 | |
| SMTC configuration |  | 1, 2 | SMTC.2 | | SMTC.Y | |
| CSI-RS parameters |  | 1, 2 | CSI-RS.1.2 FDD resource #0 | | N/A | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The 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.

#### 14.5.1.6 NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

Editor's Note:

Gap index needs to be corrected in 38.133 (from #0, #1 to #1, #2)

BWP index to be configured needs to be corrected in 38.133 (BWP-0 containing CD-SSB, BWP-1 not containing CD-SSB)

14.5.1.6.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA intra-frequency NR cell search requirements in clause 14.5.1.0.2.

14.5.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]) and CSI-RS based RLM.

14.5.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.6.

14.5.1.6.4 Test description

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 test parameters for PCell and neighbour cell are given in Tables 14.5.1.6.4.1-1, 14.5.1.6.4.1-3 and 14.5.1.6.5-1 below. 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 UE is configured with 2 PPO concurrent measurement gaps for the intra-frequency measurement. Serving Cell 1 is expected to be measured within MeasGapId #0 and Neighbour Cell 2 is expected to be measured within MeasGapId #1. The priority for MeasGapId #1 is higher than the priority for MeasGapId #0.

14.5.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.6.4.1-1.

Table 14.5.1.6.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.1.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.1.6.4.1-2.

Table 14.5.1.6.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.1.6.4.1-3.

2. Message contents are defined in clause 14.5.1.6.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.1.6.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | Cell 1 |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1 | Cell 1 and Cell 2 |
| Measurement gap type |  | 1, 2 | Per-UE gap |  |
| Gap Pattern ID |  | 1, 2 | 0 for MeasGapId #0  1 for MeasGapId #1 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap repetition periodicity | ms | 1, 2 | 40ms for MeasGapId #0  80ms for MeasGapId #1 |  |
| Measurement gap length | ms | 1, 2 | 6 |  |
| Measurement gap offset | ms | 1, 2 | 39 for MeasGapId #0  4 for MeasGapId #1 |  |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 | OFF |  |
| Time offset between serving and neighbour cells | ms | 1, 2 | 5 | Asynchronous cells.  The timing of Cell 2 is 5ms later than the timing of serving Cell 1. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

14.5.1.6.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 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.

The UE is required to report the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.1.6.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, two parallel gap configurations, and SMTC configuration according to Tables 14.5.1.6.4.1-3 and 14.5.1.6.5-1.

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 14.5.1.6.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1242 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shallswitch OFF and then ON the UE.

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

14.5.1.6.4.3 Message contents

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

**Table 14.5.1.6.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, [SMTC pattern Y], and Asynchronous cells  Table H.3.1-4 with A3-offset = -4.5dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ |

**Table 14.5.1.6.4.3-2: *MeasGapConfig* for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP\_ADD | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { |  |  |  |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries |  |  |
| GapConfig-r17[1] SEQUENCE { |  |  |  |
| measGapId-r17 | 1 | MeasGapId #1 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 39 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms40 | Gap pattern 0 |  |
| mgta-r17 | ms0 |  |  |
| } |  |  |  |
| GapConfig-r17[2] SEQUENCE { |  |  |  |
| measGapId-r17 | 2 | MeasGapId #2 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 4 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms80 | Gap pattern 1 |  |
| mgta-r17 | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.5.1.6.5 Test requirements

Tables 14.5.1.6.4.1-3 and 14.5.1.6.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access.

Table 14.5.1.6.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration |  | 1, 2 | SMTC.2 | | SMTC.Y | |
| CSI-RS parameters |  | 1, 2 | CSI-RS.1.2 FDD resource #0 | | N/A | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

satellite access

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1240 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired 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.

### 14.5.2 Inter-frequency Measurements for SAN

#### 14.5.2.0 Minimum conformance requirements

14.5.2.0.1 Minimum conformance requirements for inter-frequency measurements with measurement gaps

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 14.5.2.0.1-1.

TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 14.5.2.0.1-2.

TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 14.5.2.0.1-3.

CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in TS 38.133 [6] clause 9.1D.5.2 for measurement conducted within measurement gaps.

Kgap is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps. When the UE is configured with concurrent measurement gaps and the two measurement gaps are fully overlapping with MGRP=160ms, Kgap = 2. Otherwise, Kgap = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

For a window W of duration max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, and starting from the beginning of any SMTC occasion:

- Ntotal is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

- Navailable is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in 38.133 [6] section 9.1.8.3.

Kgap is only applicable for UE supporting *parallelMeasurementGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if Navailable =0, or if one SMTC overlaps more than one MGs associated to the frequency layer.

K\_satellite: it is a statellite specific scaling factor.

If SMTCs within a measurement gap do not overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within SMTC

K\_satellite = 1, if GSO satellites are measured on the carrier

, if LEO satellites are measured on the carrier.

If SMTCs within a measurement gap partially overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within overlapped SMTCs

, if only GEO satellites are measured on the carrier

, if only LEO satellites are measured on the carrier.

Table 14.5.2.0.1-1: Time period for PSS/SSS detection (Frequency range FR1)

|  |  |
| --- | --- |
| **Condition NOTE1** | **TPSS/SSS\_sync\_inter** |
| No DRX | Max(600ms, Ceil(8 x Kgap) × Max(MGRP, SMTC period **NOTE2**)) × CSSFinter × K\_satellite |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\*1.5 x Kgap) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter × K\_satellite |
| DRX cycle > 320ms | Ceil(8 x Kgap) × DRX cycle × CSSFinter × K\_satellite |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1  NOTE 2: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

Table 14.5.2.0.1-2: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| **Condition NOTE1** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, Ceil(3 x Kgap) × Max(MGRP, SMTC period **NOTE2**)) × CSSFinter × K\_satellite |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5 x Kgap) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter × K\_satellite |
| DRX cycle > 320ms | Ceil(3 x Kgap) × DRX cycle × CSSFinter × K\_satellite |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1  NOTE 2: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

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 10.1C.4, 10.1C.5, 10.1C.9, 10.1C.10, 10.1C.14 and 10.1C.15, respectively, as shown in table 14.5.2.0.1-3.

Table 14.5.2.0.1-3: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

|  |  |
| --- | --- |
| **Condition NOTE1** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, Ceil(8 x Kgap) × Max(MGRP, SMTC period **NOTE2**)) × CSSFinter × K\_satellite |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5 x Kgap) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter × K\_satellite |
| DRX cycle > 320ms | Ceil(8 x Kgap) × DRX cycle × CSSFinter × K\_satellite |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1  NOTE 2: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.3C.4 and 9.3C.5.

14.5.2.0.2 Minimum conformance requirements for inter-frequency measurements without measurement gaps

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 14.5.2.0.2-1.

TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 14.5.2.0.2-2.

T SSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 14.5.2.0.2-3.

CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFoutside\_gap,i in TS 38.133 [6] clause 9.1D.5.1 for measurement conducted outside measurement gaps, i.e. when inter-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to CSSFwithin\_gap,i in TS 38.133 [6] clause 9.1D.5.2 for measurement conducted within measurement gaps, i.e. when inter-frequency SMTC is fully overlapping with measurement gaps.

Kp is the scaling factor for a SSB frequency layer to be measured without measurement gaps. Kp = Ntotal\_SAN / Navailable\_SAN, where Navailable\_SAN and Ntotal\_SAN are calculated as follows:

- For a window W of duration max(SMTC period, MGRP\_max), where

- If UE supports *parallelMeasurementGap-r17* and is configured with concurrent measurement gaps, MGRP max is the maximum MGRP across all configured per-UE measurement gap. Otherwise, MGRP max is the MGRP of configured measurement gap.

- Starting from the beginning of any SMTC occasion:

- Ntotal\_SAN is the total number of SMTC occasions within the window, including those overlapped and non-overlapped with measurement gap occasions within the window, and

- Navailable\_SAN is the number of SMTC occasions within the window W that don’t collide with any non-dropped MG occasion within or outside the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1C.8.3. The collision rule between SMTC occasion and measurement gap occasion is defined in TS 38.133 [6] section 9.1C.9.1

Kp = [1] when Navailable\_SAN = 0 and measurement gap sharing in 38.133 [6] clause 9.1.2.1a shall apply.

Kp = 1 when inter-frequency SMTC is fully non overlapping with measurement gaps.

Ksatellite: it is a satellite specific scaling factor.

* If SMTCs do not overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within SMTC
  + Ksatellite = 1, if GSO satellite(s) is/are measured on the carrier
  + , if LEO satellite(s) is/are measured on the carrier.
* If SMTCs partially overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within overlapped SMTCs
  + , if only GEO satellite(s) is/are measured on the carrier
  + , if only LEO satellite(s) is/are measured on the carrier.

Table 14.5.2.0.2-1: Time period for PSS/SSS detection, (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFinter × Ksatellite |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter × Ksatellite |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFinter × Ksatellite |
| NOTE 1: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

Table 14.5.2.0.2-2: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_inter |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFinter × Ksatellite |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter × Ksatellite |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFinter × Ksatellite |
| NOTE 1: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

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 10.1C.4, 10.1C.5, 10.1C.9, 10.1C.10, 10.1C.14 and 10.1C.15, respectively, as shown in table 14.5.2.0.2-3, if UE supports inter-frequency measurement without measurement gaps:

Table 14.5.2.0.2-3: Measurement period for inter-frequency measurements without gaps ((FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_inter |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter × K\_satellite |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter × K\_satellite |
| DRX cycle>320ms | ceil( 5 x Kp ) x DRX cycle x CSSFinter × K\_satellite |
| NOTE 1: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.3C.7.1 and 9.3C.7.2.

#### 14.5.2.1 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

Editor's Note:

Neighbor cell ephemeris needs further analysis

14.5.2.1.1 Test purpose

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 14.5.2.0.1.

14.5.2.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.1.

14.5.2.1.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1 and NR FR1 neighbour cell (Cell 2) on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.1.4.1-1, 14.5.2.1.4.1-3 and 14.5.2.1.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Measurement gap pattern configuration # 0 is provided to the UE.

14.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.1.4.1-1.

Table 14.5.2.1.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.1.4.1-2.

Table 14.5.2.1.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.2.1.4.1-3.

2. Message contents are defined in clause 14.5.2.1.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.1.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
|  |  |  | Test 1 |  |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR Cell2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 9 |  |
| A3-Offset | dB | Config 1,2 | -6 |  |
| Hysteresis | dB | Config 1,2 | 0 |  |
| CP length |  | Config 1,2 | Normal |  |
| TimeToTrigger | s | Config 1,2 | 0 |  |
| Filter coefficient |  | Config 1,2 | 0 | L3 filtering is not used |
| DRX |  | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 |  |
| T2 | s | Config 1,2 | 1 |  |

14.5.2.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, gap configuration, and SMTC configuration according to Tables 14.5.2.1.4.1-3 and 14.5.2.1.5-1.

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 14.5.2.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

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

14.5.2.1.4.3 Message contents

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

**Table 14.5.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9  Table H.3.1-7 with Condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

14.5.2.1.5 Test requirements

Tables 14.5.2.1.4.1-3 and 14.5.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access.

Table 14.5.2.1.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number | |  | Config 1,2 | 1 | | 2 | |
| Satellite information | |  | Config 1 | SSC.1 | | NSC.1 | |
|  | |  | Config 2 | SSC.2 | | NSC.2 | |
| Duplex mode | |  | Config 1,2 | FDD | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| BWP configuration | Initial DL BWP | Config 1 | Config 1,2 | DLBWP.0.1 | | NA | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | NA | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | NA | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | NA | |
| TRS configuration | |  | Config 1,2 | TRS.1.1 FDD | | NA | |
| OCNG Patterns | |  | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1,2 | SR.1.1 FDD | |  | |
| RMSI CORESET Reference Channel | |  | Config 1,2 | CR.1.1 FDD | |  | |
| Dedicated CORESET Reference Channel | |  | Config 1,2 | CCR.1.1 FDD | |  | |
| SSB parameters | |  | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | |
| SMTC configuration | |  | Config 1,2 | SMTC.2 | | SMTC.5 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2 | 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 | Config 1,2 | -98 | | -98 | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| Propagation Condition | |  | Config 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 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.2.2 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

Editor's Note:

Neighbor cell ephemeris needs further analysis

Several test parameters are still in brackets

14.5.2.2.1 Test purpose

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 14.5.2.0.1.

14.5.2.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX cycle.

14.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.2.

14.5.2.2.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1 and NR FR1 neighbour cell (Cell 2) on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.2.4.1-1, 14.5.2.2.4.1-3, 14.5.2.2.5-1, 14.5.2.2.5-2 and 14.5.2.2.5-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Measurement gap pattern configuration # 0 is provided to the UE.

14.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.2.4.1-1.

Table 14.5.2.2.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.2.4.1-2.

Table 14.5.2.2.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.2.2.4.1-3.

2. Message contents are defined in clause 14.5.2.2.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.2.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR Cell2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 9 | |  |
| A3-Offset | dB | Config 1,2 | -6 | |  |
| Hysteresis | dB | Config 1,2 | 0 | |  |
| CP length |  | Config 1,2 | Normal | |  |
| TimeToTrigger | s | Config 1,2 | 0 | |  |
| Filter coefficient |  | Config 1,2 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2 | DRX.1 | DRX. 7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 | |  |
| T2 | s | Config 1,2 | [1.1] | [11] |  |

14.5.2.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, gap configuration, DRX configuration, and SMTC configuration according to Tables 14.5.2.2.4.1-3 and 14.5.2.2.5-1.

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 14.5.2.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1082 ms for Test 1 or less than 10242 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

10. Repeat step 1-9 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 14.5.2.2.4.1-3 as appropriate.

14.5.2.2.4.3 Message contents

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

**Table 14.5.2.2.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9  Table H.3.1-7 with Condition INTER-FREQ  Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1  Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

14.5.2.2.5 Test requirements

Tables 14.5.2.2.4.1-3, 14.5.2.2.5-1, 14.5.2.2.5-2 and 14.5.2.2.5-3 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access.

Table 14.5.2.2.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number | |  | Config 1,2 | 1 | | 2 | |
| Satellite information | |  | Config 1 | SSC.1 | | NSC.1 | |
|  | |  | Config 2 | SSC.2 | | NSC.2 | |
| Duplex mode | |  | Config 1,2 | FDD | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| BWP configuration | Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | NA | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | NA | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | NA | |
| TRS configuration | |  | Config 1,2 | TRS.1.1 FDD | | NA | |
| OCNG Patterns | |  | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1,2 | SR.1.1 FDD | |  | |
| RMSI CORESET Reference Channel | |  | Config 1,2 | CR.1.1 FDD | |  | |
| Dedicated CORESET Reference Channel | |  | Config 1,2 | CCR.1.1 FDD | |  | |
| SSB parameters | |  | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | |
| SMTC configuration | |  | Config 1,2 | SMTC.2 | | SMTC.5 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2 | 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 | Config 1,2 | -98 | | -98 | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| Propagation Condition | |  | Config 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 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

Table 14.5.2.2.5-2: DRX-Configuration for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| Field | Test1 | Test2 | Comment |
|  | Value | Value |  |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 |  |
| drx-RetransmissionTimerDL | sl1 | sl1 |  |
| drx-RetransmissionTimerUL | sl1 | sl1 |  |
| drx-LongCycleStartOffset | ms40 | ms640 |  |
| shortDRX | disable | disable |  |

Table 14.5.2.2.5-3: *TimeAlignmentTimer* configuration for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.2.3 NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access

Editor's Note:

Neighbor cell ephemeris needs further analysis

Several test parameters are still in brackets

14.5.2.3.1 Test purpose

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 14.5.2.0.1.

14.5.2.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.3.

14.5.2.3.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1 and NR FR1 neighbour cell (Cell 2) on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.3.4.1-1, 14.5.2.3.4.1-3 and 14.5.2.3.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Measurement gap pattern configuration # 0 is provided to the UE.

14.5.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.3.4.1-1.

Table 14.5.2.3.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.3.4.1-2.

Table 14.5.2.3.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.2.3.4.1-3.

2. Message contents are defined in clause 14.5.2.3.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.3.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR Cell2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 9 |  |
| A3-Offset | dB | Config 1,2 | -6 |  |
| Hysteresis | dB | Config 1,2 | 0 |  |
| CP length |  | Config 1,2 | Normal |  |
| TimeToTrigger | s | Config 1,2 | 0 |  |
| Filter coefficient |  | Config 1,2 | 0 | L3 filtering is not used |
| DRX |  | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 |  |
| T2 | s | Config 1,2 | 1.1 |  |

14.5.2.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is required to report the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.3.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, gap configuration, and SMTC configuration according to Tables 14.5.2.3.4.1-3 and 14.5.2.3.5-1.

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 14.5.2.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1042 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

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

14.5.2.3.4.3 Message contents

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

**Table 14.5.2.3.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9  Table H.3.1-7 with Condition INTER-FREQ and SSB Index  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

14.5.2.3.5 Test requirements

Tables 14.5.2.3.4.1-3 and 14.5.2.3.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access.

Table 14.5.2.3.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number | |  | Config 1,2 | 1 | | 2 | |
| Duplex mode | |  | Config 1,2 | FDD | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| BWP configuration | Initial DL BWP | Config 1 | Config 1,2 | DLBWP.0.1 | | NA | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | NA | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | NA | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | NA | |
| TRS configuration | |  | Config 1,2 | TRS.1.1 FDD | | NA | |
| OCNG Patterns | |  | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1,2 | SR.1.1 FDD | |  | |
| RMSI CORESET Reference Channel | |  | Config 1,2 | CR.1.1 FDD | |  | |
| Dedicated CORESET Reference Channel | |  | Config 1,2 | CCR.1.1 FDD | |  | |
| SSB parameters | |  | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | |
| SMTC configuration | |  | Config 1,2 | SMTC.2 | | SMTC.5 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2 | 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 | Config 1,2 | -98 | | -98 | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| Propagation Condition | |  | Config 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 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.2.4 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access

Editor's Note:

Several test parameters are still in brackets

14.5.2.4.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

14.5.2.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]).

14.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.4.

14.5.2.4.4 Test description

Three cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1, NR FR1 neighbour cell (Cell 2) on NR RF channel 2, and NR FR1 neighbour cell (Cell 3) also on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.4.4.1-1, 14.5.2.4.4.1-3 and 14.5.2.4.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Two parallel non-overlapping measurement gap pattern configurations are provided to the UE.

14.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.4.4.1-1.

Table 14.5.2.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.4.4.1-2.

Table 14.5.2.4.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.2.4.4.1-3.

2. Message contents are defined in clause 14.5.2.4.4.3.

3. Cell 1, Cell 2 and Cell 3 are NR cells (PCell and two neighbor cells, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1, Cell 2 and Cell 3 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.4.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR Cell 2 and NR Cell 3 | NR Cell 2 and NR Cell 3 are on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 for MeasGapId #1  0 for MeasGapId #2 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 9 for MeasGapId #1  19 for MeasGapId #2 |  |
| A3-Offset | dB | Config 1,2 | -6 |  |
| Hysteresis | dB | Config 1,2 | 0 |  |
| CP length |  | Config 1,2 | Normal |  |
| TimeToTrigger | s | Config 1,2 | 0 |  |
| Filter coefficient |  | Config 1,2 | 0 | L3 filtering is not used |
| DRX |  | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cell 2,3 |  | Config 1,2 | 3ms | Asynchronous cells.  The timing of Cell 2 and Cell 3 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 |  |
| T2 | s | Config 1,2 | 1 |  |

14.5.2.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.4.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, two parallel gap configurations, and two SMTC configurations, respectively, according to Tables 14.5.2.4.4.1-3 and 14.5.2.4.5-1.

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 14.5.2.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE and proceed with step 1.

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

14.5.2.4.4.3 Message contents

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

**Table 14.5.2.4.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

**Table 14.5.2.4.4.3-2: *MeasGapConfig* for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP\_ADD | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { |  |  |  |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries |  |  |
| GapConfig-r17[1] SEQUENCE { |  |  |  |
| measGapId-r17 | 1 | MeasGapId #1 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 9 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms40 | Gap pattern 0 |  |
| mgta-r17 | ms0 |  |  |
| } |  |  |  |
| GapConfig-r17[2] SEQUENCE { |  |  |  |
| measGapId-r17 | 2 | MeasGapId #2 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 19 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms40 | Gap pattern 0 |  |
| mgta-r17 | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.5.2.4.5 Test requirements

Tables 14.5.2.4.4.1-3 and 14.5.2.4.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access.

Table 14.5.2.4.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | | |
|  | |  |  | T1 | T2 | T1 | T2 | T1 | T2 | |
| NR RF Channel Number | |  | Config 1,2 | 1 | | 2 | | 2 | | |
| Satellite information | |  | Config 1 | SSC.1 | | NSC.1 | | | | |
|  | |  | Config 2 | SSC.2 | | NSC.2 | | | | |
| Duplex mode | |  | Config 1,2 | FDD | | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | |
| BWP configuration | Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | | NA | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | NA | | NA | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | NA | | NA | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | NA | | NA | | |
| TRS configuration | |  | Config 1,2 | TRS.1.1 FDD | | NA | | NA | | |
| OCNG Patterns | |  | Config 1,2 | OP.1 | | OP.1 | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1,2 | SR.1.1 FDD | |  | |  | | |
| RMSI CORESET Reference Channel | |  | Config 1,2 | CR.1.1 FDD | |  | |  | | |
| Dedicated CORESET Reference Channel | |  | Config 1,2 | CCR.1.1 FDD | |  | |  | | |
| SSB parameters | |  | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | | SSB.1 FR1 | | |
| SMTC configuration | |  | Config 1,2 | SMTC.2 | | [SMTC.Y] | | SMTC.1 | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2 | 0 | | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |  | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |  | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |  | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  | |  | |  | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |  | | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |  | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |  | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |  | | |
| Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | | -98 | | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | | -98 | | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 | -Infinity | | -91 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | | 7 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 | -70.05 | | -62.26 |
| Propagation Condition | |  | Config 1,2 | AWGN | | AWGN | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.2.5 Void

#### 14.5.2.6 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

Editor's Note:

Several test parameters are still in brackets

14.5.2.6.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

14.5.2.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]).

14.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.6.

14.5.2.6.4 Test description

Three cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1, NR FR1 neighbour cell (Cell 2) on NR RF channel 2, and NR FR1 neighbour cell (Cell 3) also on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.6.4.1-1, 14.5.2.6.4.1-3 and 14.5.2.6.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Two parallel partially overlapping measurement gap pattern configurations are provided to the UE. MeasGapId #2 is configured with a higher priority than MeasGapId #1.

14.5.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.6.4.1-1.

Table 14.5.2.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.6.4.1-2.

Table 14.5.2.6.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 14.5.2.6.4.1-3.

2. Message contents are defined in clause 14.5.2.6.4.3.

3. Cell 1, Cell 2 and Cell 3 are NR cells (PCell and two neighbor cells, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1, Cell 2 and Cell 3 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.6.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR Cell 2 and NR Cell 3 | NR Cell 2 and NR Cell 3 are on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 for MeasGapId #1  1 for MeasGapId #2 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 79 for MeasGapId #1  4 for MeasGapId #2 |  |
| A3-Offset | dB | Config 1,2 | -6 |  |
| Hysteresis | dB | Config 1,2 | 0 |  |
| CP length |  | Config 1,2 | Normal |  |
| TimeToTrigger | s | Config 1,2 | 0 |  |
| Filter coefficient |  | Config 1,2 | 0 | L3 filtering is not used |
| DRX |  | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cell 1 |  | Config 1,2 | 3μs | Cell 1 and Cell 2 are synchronous. |
| Time offset between serving and neighbour cell 2 |  | Config 1,2 | 5ms | Cell 1 and Cell 3 are asynchronous.  The timing of Cell 3 is 5ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 |  |
| T2 | s | Config 1,2 | 1.5 |  |

14.5.2.6.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.6.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, two parallel gap configurations, and two SMTC configurations, respectively, according to Tables 14.5.2.6.4.1-3 and 14.5.2.6.5-1.

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 14.5.2.6.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1282 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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 + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE and proceed with step 1.

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

14.5.2.6.4.3 Message contents

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

**Table 14.5.2.6.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

|  |  |
| --- | --- |
| 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  Table H.3.1-4 with A3-offset = -6dB  Table H.3.1-5  Table H.3.1-7 with Condition INTER-FREQ  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

**Table 14.5.2.6.4.3-2: *MeasGapConfig* for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP\_ADD | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { |  |  |  |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries |  |  |
| GapConfig-r17[1] SEQUENCE { |  |  |  |
| measGapId-r17 | 1 | MeasGapId #1 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 79 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms40 | Gap pattern 0 |  |
| mgta-r17 | ms0 |  |  |
| gapPriority-r17 | 2 | Lower priority |  |
| } |  |  |  |
| GapConfig-r17[2] SEQUENCE { |  |  |  |
| measGapId-r17 | 2 | MeasGapId #2 |  |
| gapType-r17 | perUE |  |  |
| gapOffset-r17 | 4 |  |  |
| mgl-r17 | ms6 |  |  |
| mgrp-r17 | ms80 | Gap pattern1 |  |
| mgta-r17 | ms0 |  |  |
| gapPriority-r17 | 1 | Higher priority |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.5.2.6.5 Test requirements

Tables 14.5.2.6.4.1-3 and 14.5.2.6.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access.

Table 14.5.2.6.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | | |
|  | |  |  | T1 | T2 | T1 | T2 | T1 | T2 | |
| NR RF Channel Number | |  | Config 1,2 | 1 | | 2 | | 2 | | |
| Satellite information | |  | Config 1 | SSC.1 | | NSC.1 | | | | |
|  | |  | Config 2 | SSC.2 | | NSC.2 | | | | |
| Duplex mode | |  | Config 1,2 | FDD | | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | |
| BWP configuration | Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | | NA | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | NA | | NA | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | NA | | NA | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | NA | | NA | | |
| TRS configuration | |  | Config 1,2 | TRS.1.1 FDD | | NA | | NA | | |
| OCNG Patterns | |  | Config 1,2 | OP.1 | | OP.1 | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1,2 | SR.1.1 FDD | |  | |  | | |
| RMSI CORESET Reference Channel | |  | Config 1,2 | CR.1.1 FDD | |  | |  | | |
| Dedicated CORESET Reference Channel | |  | Config 1,2 | CCR.1.1 FDD | |  | |  | | |
| SSB parameters | |  | Config 1,2 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | | |
| SMTC configuration | |  | Config 1,2 | SMTC.2 | | SMTC.2 | | [SMTC.Y] | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2 | 0 | | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |  | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |  | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |  | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  | |  | |  | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |  | | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |  | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |  | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |  | | |
| Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | | -98 | | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | | -98 | | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 | -Infinity | | -91 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | | 7 |
|  | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 | -70.05 | | -62.26 |
| Propagation Condition | |  | Config 1,2 | AWGN | | AWGN | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.2.7 NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Call setup and test procedure needs to be updated
* Applicability needs to be updated
* Several sections are in brackets
* Several test parameters and configuration are still in brackets
* Neighbor cell ephemeris needs further analysis

14.5.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in clauses 14.5.2.0.2

14.5.2.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.7.

14.5.2.7.4 Test description

Supported test configurations are shown in table 14.5.2.7.4.1-1. Two cells are deployed in the test, which are FR1 PCell (Cell 1) on NR RF channel 1 and a FR1 neighbour cell (Cell 2) on NR RF channel 2. 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.

14.5.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.7.4.1-1.

Table 14.5.2.7.4.1-1: NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.7-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.7-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.2.7.4.1-2.

Table 14.5.2.7.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.5.2.7.4.1-3.

2. Message contents are defined in clause 14.5.2.7.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.7.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | Cell 1 |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 |  |
| SMTC1 configuration |  | 1 | SMTC.1 | Period: 20ms, offset: 0 |
| SMTC2 configuration |  | 2 | SMTC.4 | Period: 20ms, offset: 10ms |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 |  | OFF |
| Time offset between serving and neighbour cells |  | 1, 2 | 20 ms | Asynchronous cells.  The timing of Cell 2 is 20ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

14.5.2.7.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.7.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, with 2 non-overlapping SMTCs for the inter-frequency measurement according to Tables 14.5.2.7.4.1-3 and 14.5.2.7.5-1.

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 14.5.2.7.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 800 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS 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. Once the connection is released, the SS [shall reset the satellite access channel model and then] switch OFF and then ON the UE and proceed with step 1.

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

14.5.2.7.4.3 Message contents

FFS

14.5.2.7.5 Test requirements

Table 14.5.2.7.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access.

Table 14.5.2.7.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | Config 1 | SSC.1 | | NSC.1 | |
|  |  | Config 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | Config 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration |  | Config 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | Config 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | Config 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | Config 1, 2 | OP.1 | | OP.1 | |
| TRS Configuration |  | Config 1, 2 | TRS.1.1 FDD | | N/A | |
| IInitial BWP configuration |  | Config 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | Config 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | Config 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | Config 1, 2 | SSB | | SSB | |
| Note 2 | dBm/SCS | Config 1, 2 | -98+TT | | | |
| Note 2 | dBm/15 kHz | Config 1, 2 | -98+TT | | | |
|  | dB | Config 1, 2 | 4+TT | -1.46+TT | -Infinity | -1.46+TT |
|  | dB | Config 1, 2 | 4+TT | 4+TT | -Infinity | 4+TT |
| SS-RSRP Note 3 | dBm/SCS kHz | Config 1, 2 | -94+TT | -94+TT | -Infinity | -94+TT |
| Io | dBm/9.36 MHz | Config 1, 2 | -64.60+TT | -62.25+TT | --64.60+TT | -62.25+TT |
| Propagation Condition |  | Config 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The 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.

#### 14.5.2.8 NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access

Editor's Note:

* MU and TT analysis is incomplete
* Message contents are FFS
* Call setup and test procedure needs to be updated
* Applicability needs to be updated
* Several sections are in brackets
* Several test parameters and configuration are still in brackets

14.5.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in clauses 14.5.2.0.2

14.5.2.8.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

14.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.8.

14.5.2.8.4 Test description

Supported test configurations are shown in table 14.5.2.8.4.1-1. Two cells are deployed in the test, which are FR1 PCell (Cell 1) on NR RF channel 1 and a FR1 neighbour cell (Cell 2) on NR RF channel 2. 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.

14.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.8.4.1-1.

Table 14.5.2.8.4.1-1: NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.2.8-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.8-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.2.8.4.1-2.

Table 14.5.2.8.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 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 14.5.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.5.2.8.4.1-3.

2. Message contents are defined in clause 14.5.2.8.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.2.8.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| Active cell |  | 1, 2 | Cell 1 | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| NTN reference configuration |  | 1 | SSC.1, NSC.1 | | For GSO |
| 2 | SSC.2, NSC.2 | | For NGSO |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | |  |
| SMTC configuration |  | 1, 2 | SMTC.2 | |  |
| A3-Offset | dB | 1, 2 | -4.5 | |  |
| CP length |  | 1, 2 | Normal | |  |
| Hysteresis | dB | 1, 2 | 0 | |  |
| Time To Trigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | DRX.1 | DRX. 7 |  |
| Time offset between serving and neighbour cells |  | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 5 | 10 |  |

14.5.2.8.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle

The UE is not required to read the neighbour cell SSB index in 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 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.8.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, with 1 SMTC for the inter-frequency measurement according to Table 14.5.2.8.4.1-3.

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 14.5.2.8.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay 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 are

- X=1280 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=920.

- Y=12800 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise Y=6400.

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. Once the connection is released, the SS [shall reset the satellite access channel model and then] switch OFF and then ON the UE and proceed with step 1.

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 14.5.2.8.4.1-3 as appropriate.

14.5.2.8.4.3 Message contents

FFS

14.5.2.8.5 Test requirements

Table 14.5.2.8.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access.

Table 14.5.2.8.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Satellite information |  | 1 | SSC.1 | | NSC.1 | |
|  |  | 2 | SSC.2 | | NSC.2 | |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| IInitial BWP configuration |  | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98+TT | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98+TT | | | |
|  | dB | 1, 2 | 4+TT | -1.46+TT | -Infinity | -1.46+TT |
|  | dB | 1, 2 | 4+TT | 4+TT | -Infinity | 4+TT |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94+TT | -94+TT | -Infinity | -94+TT |
| Io | dBm/9.36 MHz | 1, 2 | -64.60+TT | -62.25+TT | -64.60+TT | -62.25+TT |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. X=1280 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=920.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than Y ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. Y=12800 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise Y=6400.

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.

### 14.5.3 L1-RSRP measurement for beam reporting for SAN

#### 14.5.3.0 Minimum conformance requirements

##### 14.5.3.0.1 Minimum conformance requirements for SSB based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_SSB\_SAN.

The value of TL1-RSRP\_Measurement\_Period\_SSB\_SAN is defined in Table 14.5.3.0.1-1 for FR1, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- P value for SSB resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any SSB resource occasion:

- Ntotal is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target SSB.

- Psharing factor = 3.

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

Table 14.5.3.0.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB\_SAN for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB\_SAN (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to TS 38.133 [6] clause 10.1.19C for FR1 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in TS 38.133 [6] clause 10.1.19C for FR1. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in TS 38.133 [6] clause 10.1.6.

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1.19C.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [9].

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If SSB and CSI-RS have different SCS,

- If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5C.3.1, 9.5C.4.1 and 9.5C.5.1.

##### 14.5.3.0.2 Minimum conformance requirements for CSI-RS based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN.

The value of TL1-RSRP\_Measurement\_Period\_CSI-RS is defined in Table 14.5.3.0.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- P value for a CSI-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CSI-RS resource occasion:

- Ntotal is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target CSI-RS.

- Psharing factor = 3.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

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

Table 14.5.3.0.2-1: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to TS 38.133 [6] clause 10.1.19C for FR1 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in TS 38.133 [6] clause 10.1.19C for FR1. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in TS 38.133 [6] clause 10.1.6.

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in TS 38.133 [6] clauses 10.1.19C.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.1.2.1 in TS 38.214 [9].

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

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

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

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

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

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

The normative reference for this requirement is TS 38.133 [6] clauses 9.5C.3.3, 9.5C.4.2 and 9.5C.5.2.

#### 14.5.3.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure are FFS
* Test requirements contain parameters in square brackets.

14.5.3.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in 14.5.3.0.1.

14.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.1.

14.5.3.1.4 Test description

Supported test configurations are shown in table 14.5.3.1.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

14.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.1.4.1-1.

Table 14.5.3.1.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP test for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.3.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.3.1.4-2.

Table 14.5.3.1.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP test for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.1.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.5.3.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.5.3.1.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.3.1.4.1-3: General test parameters for NR SA FR1 SSB based L1-RSRP test for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1, 2 |  | freq1 |
| Duplex mode | 1, 2 |  | FDD |
| TDD Configuration | 1, 2 |  | N/A |
| BWchannel | 1, 2 | MHz | 10: NRB,c = 52 |
| PDSCH Reference measurement channel | 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 |  | CCR.1.1 FDD |
| SSB configuration | 1, 2 |  | SSB.3 FR1 |
| OCNG Patterns | 1, 2 |  | OP.1 |
| Initial BWP Configuration | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1, 2 |  | SMTC.1 |
| TRS Configuration | 1, 2 |  | TRS.1.1 FDD |
| 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 | 80 |
| T1 | 1, 2 | s | 5 |
| T2 | 1, 2 | s | 1 |
| 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. | | | |

14.5.3.1.4.2 Test procedure

FFS

14.5.3.1.4.3 Message contents

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

Table 14.5.3.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with conditions SSB and PERIODIC  Table H.3.6-10 |

Table 14.5.3.1.4.3-2: 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 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.5.3.1.5 Test requirement

Table 14.5.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 14.5.3.1.5-1: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Note2 | 1, 2 | dBm/15kHz | -94.65+TT | | | |
| Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | | | |
|  | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -94.65+TT | -94.65+TT | -Infinity | -91.65+TT |
|  |  |  |  |  |  |  |
| Io Note3 | 1, 2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
|  | 1, 2 | dB | 0+TT | 0+TT | -Infinity | 3+TT |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 14.5.3.1.5-2 and the corresponding relative accuracy requirements in Table 14.5.3.1.5-3.

Table 14.5.3.1.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | [FFS] | [FFS] |
| Highest reported value (SSB#1) | [FFS] | [FFS] |

Table 14.5.3.1.5-3: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |
| Highest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |

For the test to pass, the ratio of successful reported values for each requirement (RX to RY) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.3.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure are FFS
* Test requirements contain parameters in square brackets.

14.5.3.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in 14.5.3.0.1.

14.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access and long DRX cycle.

14.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.2.

14.5.3.2.4 Test description

Supported test configurations are shown in table 14.5.3.2.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

14.5.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.2.4.1-1.

Table 14.5.3.2.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP test for satellite access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.3.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.3.2.4-2.

Table 14.5.3.2.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP test for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.2.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.5.3.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.5.3.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.3.2.4.1-3: General test parameters for NR SA FR1 SSB based L1-RSRP test for satellite access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1, 2 |  | freq1 |
| Duplex mode | 1, 2 |  | FDD |
| TDD Configuration | 1, 2 |  | N/A |
| BWchannel | 1, 2 | MHz | 10: NRB,c = 52 |
| PDSCH Reference measurement channel | 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 |  | CCR.1.1 FDD |
| SSB configuration | 1, 2 |  | SSB.3 FR1 |
| OCNG Patterns | 1, 2 |  | OP.1 |
| Initial BWP Configuration | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1, 2 |  | SMTC.1 |
| TRS Configuration | 1, 2 |  | TRS.1.1 FDD |
| 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 | 80 |
| T1 | 1, 2 | s | 5 |
| T2 | 1, 2 | s | 1 |
| 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. | | | |

14.5.3.2.4.2 Test procedure

FFS

14.5.3.2.4.3 Message contents

Same message content as in subclause 14.5.3.2.4.3 with the following exception:

Table 14.5.3.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

14.5.3.2.5 Test requirement

Table 14.5.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 14.5.3.2.5-1: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Note2 | 1, 2 | dBm/15kHz | -94.65+TT | | | |
| Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | | | |
|  | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -94.65+TT | -94.65+TT | -Infinity | -91.65+TT |
|  |  |  |  |  |  |  |
| Io Note3 | 1, 2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
|  | 1, 2 | dB | 0+TT | 0+TT | -Infinity | 3+TT |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 14.5.3.2.5-2 and the corresponding relative accuracy requirements in Table 14.5.3.2.5-3.

Table 14.5.3.2.5-2: L1-RSRP absolute accuracy requirements for  
the reported values for test configurations 1, 2, 4 and 5

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest reported value (SSB#1) | [FFS] | [FFS] |
| Highest reported value (SSB#1) | [FFS] | [FFS] |

Table 14.5.3.2.5-3: L1-RSRP relative accuracy requirements for  
the reported values for all test configurations

|  |  |  |
| --- | --- | --- |
| Normal Conditions | T1 | T2 |
| Lowest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |
| Highest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |

For the test to pass, the ratio of successful reported values for each requirement (XX to YY) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### 14.5.3.3 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure are FFS
* Applicability needs to be updated.
* Test requirements contain parameters in square brackets.

14.5.3.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in 14.5.3.0.2.

14.5.3.3.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.3.

14.5.3.3.4 Test description

Supported test configurations are shown in table 14.5.3.3.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

14.5.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.3.4.1-1.

Table 14.5.3.3.4.1-1: Supported test configurations for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.3.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.3.3.4-2.

Table 14.5.3.3.4.1-2: Initial conditions for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.3.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.5.3.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.5.3.3.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.3.3.4.1-3: General test parameters for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1, 2 |  | freq1 |
| Duplex mode | 1, 2 |  | FDD |
| TDD Configuration | 1, 2 |  | N/A |
| BWchannel | 1, 2 | MHz | 10: NRB,c = 52 |
| PDSCH Reference measurement channel | 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 |  | CCR.1.1 FDD |
| SSB configuration | 1, 2 |  | SSB.3 FR1 |
| CSI-RS configuration | 1, 2 |  | CSI-RS 1.3 FDD |
| OCNG Patterns | 1, 2 |  | OP.1 |
| TRS Configuration | 1, 2 |  | TRS.1.1 FDD |
| Initial BWP Configuration | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1, 2 |  | SMTC.1 |
| DRX configuration | 1, 2 |  | Off |
| reportConfigType | 1, 2 |  | aperiodic |
| reportQuantity | 1, 2 |  | cri-RSRP |
| Number of reported RS | 1, 2 |  | 2 |
| qcl-Info | 1, 2 |  | SSB#0 for resource#0 |
|  |  |  | SSB#1 for resource#1 |
| reportSlotOffsetList | 1, 2 | slots | 8 |
| T1 | 1, 2 | s | 5 |
| 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. | | | |

14.5.3.3.4.2 Test procedure

FFS

14.5.3.3.4.3 Message contents

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

Table 14.5.3.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions APERIODIC and CSI-RSRP  Table H.3.6-3 with condition CSI-RS  TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC |

Table 14.5.3.3.4.3-2: 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. |  |
| detectionResource CHOICE { |  |  |  |
| ssb-Index | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.5.3.3.5 Test requirement

Table 14.5.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 14.5.3.3.5-1: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Note1 | 1, 2 | dBm/15kHz | -94.65+TT | |
| Note1 | 1, 2 | dBm/SSB SCS | -94.65+TT | |
|  |  |  |  | |
|  | 1, 2 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | -91.65+TT |
|  |  |  |  |  |
| Io Note2 | 1, 2 | dBm/9.36 MHz | -63.69+TT | -61.93+TT |
|  |  |  |  |  |
|  | 1, 2 | dB | 0+TT | 3+TT |
| Note 1:  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.1 and relative accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.2.

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.

#### 14.5.3.4 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure are FFS
* Applicability needs to be updated.
* Test requirements contain parameters in square brackets.

14.5.3.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in 14.5.3.0.2.

14.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite and long DRX cycle.

14.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.4.

14.5.3.4.4 Test description

Supported test configurations are shown in table 14.5.3.4.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

14.5.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.4.4.1-1.

Table 14.5.3.4.4.1-1: Supported test configurations for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.5.3.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.5.3.4.4-2.

Table 14.5.3.4.4.1-2: Initial conditions for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.4.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | N/A | |  |

1. Message contents are defined in clause 14.5.3.4.4.3.

2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.5.3.4.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

Table 14.5.3.4.4.1-3: General test parameters for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1, 2 |  | freq1 |
| Duplex mode | 1, 2 |  | FDD |
| TDD Configuration | 1, 2 |  | N/A |
| BWchannel | 1, 2 | MHz | 10: NRB,c = 52 |
| PDSCH Reference measurement channel | 1, 2 |  | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 |  | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 |  | CCR.1.1 FDD |
| SSB configuration | 1, 2 |  | SSB.3 FR1 |
| CSI-RS configuration | 1, 2 |  | CSI-RS 1.3 FDD |
| OCNG Patterns | 1, 2 |  | OP.1 |
| TRS Configuration | 1, 2 |  | TRS.1.1 FDD |
| Initial BWP Configuration | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1, 2 |  | SMTC.1 |
| DRX configuration | 1, 2 |  | DRX.3 |
| reportConfigType | 1, 2 |  | aperiodic |
| reportQuantity | 1, 2 |  | cri-RSRP |
| Number of reported RS | 1, 2 |  | 2 |
| qcl-Info | 1, 2 |  | SSB#0 for resource#0 |
|  |  |  | SSB#1 for resource#1 |
| reportSlotOffsetList | 1, 2 | slots | 8 |
| T1 | 1, 2 | s | 5 |
| 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. | | | |

14.5.3.4.4.2 Test procedure

FFS

14.5.3.4.4.3 Message contents

Same message content as in subclause 14.5.3.3.4.3 with the following exception:

Table 14.5.3.4.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

14.5.3.4.5 Test requirement

Table 14.5.3.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 14.5.3.4.5-1: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Note1 | 1, 2 | dBm/15kHz | -94.65+TT | |
| Note1 | 1, 2 | dBm/SSB SCS | -94.65+TT | |
|  |  |  |  | |
|  | 1, 2 | dB | 0+TT | 3+TT |
| CSI-RS RSRP Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | -91.65+TT |
|  |  |  |  |  |
| Io Note2 | 1, 2 | dBm/9.36 MHz | -63.69+TT | -61.93+TT |
|  |  |  |  |
|  | 1, 2 | dB | 0+TT | 3+TT |
| Note 1:  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.1 and relative accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.2.

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.

## 14.6 Measurement Performance Requirements

### 14.6.1 SS-RSRP for SAN

#### 14.6.1.0 Minimum conformance requirements

##### 14.6.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements for FR1 SAN

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 FR1.

The accuracy requirements in Table 14.6.1.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.1.0.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±4.5 | ±9 | ≥-6 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR\_FDD\_SAB\_FR1\_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1A | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.2C.1.1.

##### 14.6.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements for FR1 SAN

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 14.6.1.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.1.0.2-1: SS-RSRP Intra frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±2 | ±3 | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.2C.1.2.

##### 14.6.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements for FR1 SAN

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 14.6.1.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.1.0.3-1: SS-RSRP Inter frequency Absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±4.5 | ±9 | ≥-6 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR\_FDD\_SAB\_FR1\_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: Void  NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.4C.1.1.

##### 14.6.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements for FR1 SAN

The relative accuracy of SS-RSRP in inter frequency case is defined as the RSRP measured from one cell on a frequency in FR1compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 14.6.1.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- |SSB\_RP1dBm - SSB\_RP2dBm| ≤ 27 dB

- |Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.1.0.4-1: SS-RSRP Inter frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±4.5 | ±6 | ≥-6 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.4C.1.2.

#### 14.6.1.1 NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure may need to be updated.
* Test requirements contain parameters in square brackets.

14.6.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

14.6.1.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.6.1.0.1 and 14.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.1.1.

14.6.1.1.4 Test description

Supported test configurations are shown in table 14.6.1.1.4.1-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in 14.6.1.1.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

14.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.1.1.4.1-1.

Table 14.6.1.1.4.1-1: Supported test configurations for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.6.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.6.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.6.1.1.4.1-2.

Table 14.6.1.1.4.1-2: Initial conditions for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A.  [4Rx support is FFS, diagram may need to be removed] |
| [TE Part 4Rx] | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| [DUT Part 4Rx] | A.3.2.5.2 |
| Exceptions to connection diagram | - Without LTE link | |  |

1. The general test parameter settings are set up according to Table 14.6.1.1.5-1

2. Message contents are defined in clause 14.6.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.1.1.4.2 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 14.6.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 14.6.1.1.4.3.

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. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Tables 14.6.1.1.5-2 and 14.6.1.1.5-3 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 14.6.1.1.5-1 as appropriate and repeat steps 5-7.

14.6.1.1.4.3 Message contents

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

Table 14.6.1.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition SSB.1 FR1  Table H.3.1-5  Table H.3.1-7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

Table 14.6.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

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

14.6.1.1.5 Test requirement

Table 14.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 14.6.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.1.1.5-2 and the relative accuracy requirements in Table 14.6.1.1.5-3, correspondingly.

Table 14.6.1.1.5-1: Cell specific test parameters for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | Test 2 | | | | | | Test 3 | | | | | |
|  | | |  | Cell 1 | Cell 2 | | Cell 1 | | Cell 2 | | | | Cell 1 | | | Cell 2 | | |
| Cell ID | | |  | 489 | 0 | | 489 | | 0 | | | | 489 | | 0 | | | |
| SSB ARFCN | | |  | freq1 | | | freq1 | | | | | | freq1 | | | | | |
| BWchannel | | Config 1,2 | MHz | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| BWP BW | | Config 1,2 |  | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | |
| TRS configuration | | Config 1,2 |  | TRS.1.1 FDD | | NA | | TRS.1.1 FDD | | | NA | TRS.1.1 FDD | | | | | | NA |
| DRX Cycle | | Config 1,2 | ms | Not Applicable | | | | | | | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1,2 |  | SR.1.1 FDD | | - | SR.1.1 FDD | | - | | | | SR.1.1 FDD | | | | | - |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 FDD | | - | CR.1.1 FDD | | - | | | | CR.1.1 FDD | | | | | - |
| Control channel RMC | | Config 1,2 |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | | - | | | | CCR.1.1 FDD | | | | | - |
| SSB configuration | | Config 1,2 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | | SSB.1 FR1 | | | | SSB.1 FR1 | | | | SSB.1 FR1 | |
| Time offset with Cell 1 | | Config 1,2 | ms | - | | 3 | - | | 3 | | | | - | | | | 3 | |
| SMTC configuration | | Config 1,2 |  | SMTC.2 | | | | | | | | | | | | | | |
| OCNG Patterns | |  |  | OCNG pattern 1 | | | | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | 0 | | | 0 | | | | 0 | | | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |  | | |  | | | |  | | | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |  | | |  | | | |  | | | |  |
| Note2 | Config 1,2 | NR\_FDD\_FR1\_A | dBm/15kHz | -106+TT | | | -88+TT | | | | | | | -114+TT | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -106+TT | | | -88+TT | | | | | | | Same as Noc/15kHz | | | | |
|  | | | dB | 2.46 | | -5.97 | 2.46 | | | -5.97 | | | | -0.01 | | | | -4.76 |
|  | | | dB | 6+TT | | 1+TT | 6+TT | | | 1+TT | | | | 3+TT | | | | 0+TT |
| SS-RSRPNote3 | Config 1,2 | NR\_FDD\_FR1\_A | dBm/SCS | -100+TT | | -105+TT | -82+TT | | | -87+TT | | | | -111.00+TT | | | | -114.00+TT |
| IoNote3 | Config 1,2 | NR\_FDD\_FR1\_A | dBm/  9.36MHz | -70.09 | | | -52.09 | | | | | | | -80.03 | | | | |
| Propagation condition | | | - | AWGN | | | | | | | | | | | | | | |
| Antenna configuration | | |  | 1x2 | | | | | | | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | | | | | | | | | | |

Table 14.6.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

Table 11.6.1.1.5-3: SS-RSRP Intra frequency relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP\_x - FFS | SS-RSRP\_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP\_x + FFS | SS-RSRP\_x + FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP\_x - FFS | SS-RSRP\_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP\_x + FFS | SS-RSRP\_x + 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%.

#### 14.6.1.2 NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure may need to be updated.
* Test requirements contain parameters in square brackets.

14.6.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

14.6.1.2.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.6.1.0.3 and 14.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.1.2.

14.6.1.2.4 Test description

Supported test configurations are shown in table 14.6.1.2.4.1-1. Both absolute and relative accuracy of SS-RSRP inter-frequency measurements are tested by using the parameters in 14.6.1.2.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

14.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.1.2.4.1-1.

Table 14.6.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.6.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.6.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 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 14.6.1.2.4.1-2.

Table 14.6.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A.  [4Rx support is FFS, diagram may need to be removed] |
| [TE Part 4Rx] | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| [DUT Part 4Rx] | A.3.2.5.2 |
| Exceptions to connection diagram | - Without LTE link | |  |

1. The general test parameter settings are set up according to Table 14.6.1.2.5-1

2. Message contents are defined in clause 14.6.1.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour, on a different frequency than the PCell, and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.1.2.4.2 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 14.6.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 14.6.1.2.4.3.

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. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Tables 14.6.1.2.5-2 and 14.6.1.2.5-3 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 14.6.1.2.5-1 as appropriate and repeat steps 5-7.

14.6.1.2.4.3 Message contents

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

Table 14.6.1.2.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| 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  Table H.3.1-5  Table H.3.1-7 with condition INTER-FREQ  Table H.3.1-6 with condition Pattern #0  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

Table 14.6.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

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

14.6.1.2.5 Test requirement

Table 14.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 14.6.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.1.2.5-2 and the relative accuracy requirements in Table 14.6.1.2.5-3, correspondingly.

Table 14.6.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | MHz | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | |
| PDSCH Reference measurement channel | | 1, 2 |  | SR.1.1 FDD | | | - | SR.1.1 FDD | | - |
| RMSI CORESET Reference Channel | | 1, 2 |  | CR.1.1 FDD | | | - | CR.1.1 FDD | | - |
| Dedicated CORESET Reference Channel | | 1, 2 |  | CCR.1.1 FDD | | | - | CCR.1.1 FDD | | - |
| SSB configuration | | 1, 2 |  | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| OCNG Patterns | | 1, 2 |  | OP.1 | | | | OP.1 | | |
| TRS configuration | | 1, 2 |  | TRS.1.1 FDD | | - | | TRS.1.1 FDD | |  |
| Initial BWP Configuration | | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 | | | | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP configuration | | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 | | | | DLBWP.1.1  ULBWP.1.1 | | |
| Time offset with Cell 1 | | 1, 2 | ms | - | 3 | | | - | 3 | |
| SMTC configuration | | 1, 2 |  | SMTC.2 | | | | SMTC.2 | | |
| 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 | |  |  |  | | |  |  | |  |
| Note2 | NR\_FDD\_FR1\_A | 1,2 | dBm/15kHz | -94.65+TT | | | | ( for Channel 2 +8dB) | | -115+TT |
| Note2 | NR\_FDD\_FR1\_A | 1,2 | dBm/SSB SCS | -94.65+TT | | | | ( for Channel 2 +8dB) | | -115+TT |
|  | | 1,2 | dB | 10 | | | 10 | 13 | | -3 |
| SS-RSRPNote3 | NR\_FDD\_FR1\_A | 1,2 | dBm/SCS | -84.65+TT | | | | (RSRP for Cell 2 +25dB) | | -118.00+TT |
| IoNote3 | NR\_FDD\_FR1\_A | 1,2 | dBm/  9.36MHz | -56.28 | | | | (Io for Channel 2 +19.75dB) | | -85.28 |
|  | | 1,2 | dB | 10+TT | | | 10+TT | 13+TT | | -3+TT |
| Propagation condition | | 1,2 | - | AWGN | | | | AWGN | | |
| Antenna configuration | | 1,2 |  | 1x2 | | | | 1x2 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | | |

Table 14.6.1.2.5-2: SS-RSRP Inter frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

Table 11.6.1.1.5-3: SS-RSRP Inter frequency relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP\_x - FFS | SS-RSRP\_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP\_x + FFS | SS-RSRP\_x + FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP\_x - FFS | SS-RSRP\_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP\_x + FFS | SS-RSRP\_x + 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%.

### 14.6.2 SS-RSRQ for SAN

#### 14.6.2.0 Minimum conformance requirements

##### 14.6.2.0.1 Intra-frequency absolute SS-RSRQ measurement accuracy requirements for FR1 SAN

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 14.6.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.2.0.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±2.5 | ±4 | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.7C.1.1.

##### 14.6.2.0.2 Inter-frequency absolute SS-RSRQ measurement accuracy requirements for FR1 SAN

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 14.6.2.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.2.0.2-1: SS-RSRQ Inter frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±[2.5] | ±[4] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±[3.5] | ±[4] | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.9C.1.1.

##### 14.6.2.0.3 Inter-frequency relative SS-RSRQ measurement accuracy requirements for FR1 SAN

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR1 compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 14.6.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- |SSB\_RP1dBm - SSB\_RP2dBm| ≤ 27 dB

- |Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.2.0.3-1: SS-RSRQ Inter frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  | Note 2 | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±3 | ±4 | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.9C.1.2.

#### 14.6.2.1 NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure may need to be updated.
* Test requirements contain parameters in square brackets.

14.6.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

14.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.2.1.

14.6.2.1.4 Test description

Supported test configurations are shown in table 14.6.2.1.4.1-1. The absolute accuracy of SS-RSRQ intra-frequency is tested by using the parameters in 14.6.2.1.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

14.6.2.1.4.1 Initial conditions

Table 14.6.2.1.4.1-1: Supported test configurations for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| Config | Description |
| 14.6.2.1-1 | GSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 14.6.2.1-2 | NGSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.2.1.4.1-2.

Table 14.6.2.1.4.1-2: Initial conditions for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A.  [4Rx support is FFS, diagram may need to be removed] |
| [TE Part 4Rx] | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| [DUT Part 4Rx] | A.3.2.5.2 |
| Exceptions to connection diagram | - Without LTE link | |  |

1. The general test parameter settings are set up according to Table 14.6.2.1.5-1

2. Message contents are defined in clause 14.6.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.2.1.4.2 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 14.6.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 14.6.2.1.4.3.

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 14.6.2.1.5-2 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 14.6.2.1.5-1 as appropriate and repeat steps 5-7.

14.6.2.1.4.3 Message contents

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

Table 14.6.2.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2  Table H.3.1-3 with Condition SSB.1 FR1  Table H.3.1-5  Table H.3.1-7  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

Table 14.6.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

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

14.6.2.1.5 Test requirement

Table 14.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 14.6.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.2.1.5-2.

Table 14.6.2.1.5-1: Cell specific test parameters for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Test 1 | | | | | Test 2 | | | | Test 3 | | |
|  | | | |  | Cell 1 | | | Cell 2 | | Cell 1 | | Cell 2 | | Cell 1 | | Cell 2 |
| SSB ARFCN | | | |  | freq1 | | | | | freq1 | | | | freq1 | | |
| Duplex mode | | | Config 1,2 |  | FDD | | | | | | | | | | | |
| BWchannel | | | Config 1,2 | MHz | 10: NRB,c = 52 | | | | | | | | | | | |
| Gap Pattern ID | | |  |  | 0 | | | | | | | | | | | |
| BWP configuration | | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | | | |
|  | | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | | | | | | |
|  | | | Initial UL BWP |  | ULBWP.0.1 | | | | | | | | | | | |
|  | | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | | | |
| DRX Cycle | | | | ms | Not Applicable | | | | | | | | | | | |
| PDSCH Reference measurement channel | | | Config 1,2 |  | SR.1.1 FDD | | - | | | SR.1.1 FDD | | - | | SR.1.1 FDD | | - |
| RMSI CORESET Reference Channel | | | Config 1,2 |  | CR.1.1 FDD | | - | | | CR.1.1 FDD | | - | | CR.1.1 FDD | |  |
| Control Channel RMC | | | Config 1,2 |  | CCR.1.1 FDD | | - | | | CCR.1.1 FDD | | - | | CCR.1.1 FDD | | - |
| TRS Configuration | | | Config 1,2 |  | TRS.1.1 FDD | | - | | | TRS.1.1 FDD | | - | | TRS.1.1 FDD | | - |
| OCNG Patterns | | | |  | OP. 1 | | | | | | | | | | | |
| SS-RSSI-Measurement | | | |  | Not Applicable | | | | | | | | | | | |
| Time offset with Cell 1 | | | Config 1,2 | ms | - | 3 | | | - | | 3 | | - | | 3 | |
| SMTC configuration | | | Config 1,2 |  | SMTC.2 | | | | | | | | | | | |
| SSB configuration | | | Config 1,2 |  | SSB.1 FR1 | | | | | | | | | | | |
| CSI-RS for tracking | | | Config 1,2 |  | TRS.1.1 FDD | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | | 0 | | | 0 | | 0 | | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of PBCH to PBCH DMRS | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of PDCCH DMRS to SSS | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of PDSCH DMRS to SSS | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of PDSCH to PDSCH | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |  |  | |  | | |  | |  | |  | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |  |  | |  | | |  | |  | |  | |  |
| Note2 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/15kHz | -85+TT | | | | | -101+TT | | | | -114+TT | | |
| Note2 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/SCS | -85+TT | | | | | -101+TT | | | | -114+TT | | |
|  | | | | dB | -1.76 | | | | | -4.7 | | | | -5..46 | | -5.46 |
|  | | | | dB | 3+TT | | 3+TT | | | -2.9+TT | | -2.9+TT | | -4+TT | | -4+TT |
| SS-RSRPNote3 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/SCS | -82+TT | | -82+TT | | | -103.9+TT | | -103.9+TT | | -118+TT | | -118+TT |
| SS-RSRQ Note3 | | | NR\_FDD\_SAB\_FR1\_A | dB | TBD | | -14.84+TT | | | -14.84+TT | | -16.76+TT | | -16.76+TT | | -17.34+TT |
| IoNote3 | | Config 1,2 | NR\_FDD\_SAB\_FR1\_A | dBm/  9.36MHz | -50 | | | | | -70 | | | | -83.5 | | |
| Propagation condition | | | | - | AWGN | | AWGN | | | AWGN | | AWGN | | AWGN | | AWGN |
| Antenna configuration | | | |  | 1x2 | | 1x2 | | | 1x2 | | 1x2 | | 1x2 | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3A.4.1A. | | | | | | | | | | | | | | | | |

Table 14.6.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | 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%.

#### 14.6.2.2 NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

Editor’s note: This test case is incomplete in following aspects:

* MU and TT analysis is incomplete.
* Message contents may need to be updated.
* Call setup and test procedure may need to be updated.
* Test requirements contain parameters in square brackets.

14.6.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

14.6.2.2.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

14.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.6.2.0.2 and 14.6.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.2.2.

14.6.2.2.4 Test description

Supported test configurations are shown in table 14.6.2.2.4.1-1. Both absolute and relative accuracy of SS-RSRQ inter-frequency measurements are tested by using the parameters in 14.6.2.2.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

14.6.2.2.4.1 Initial conditions

Table 14.6.2.2.4.1-1: Supported test configurations for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| Config | Description |
| 14.6.2.2-1 | GSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 14.6.2.2-2 | NGSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.2.2.4.1-2.

Table 14.6.2.2.4.1-2: Initial conditions for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A.  [4Rx support is FFS, diagram may need to be removed] |
| [TE Part 4Rx] | A.3.1.8.5 with n = 2 and φ1,1 = 5 Hz, φ1,2 = 10 Hz, φ1,3 = 15 Hz |
| DUT Part 2Rx | A.3.2.3.4 |
| [DUT Part 4Rx] | A.3.2.5.2 |
| Exceptions to connection diagram | - Without LTE link | |  |

1. The general test parameter settings are set up according to Table 14.6.2.2.5-1

2. Message contents are defined in clause 14.6.2.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour, on a different frequency than the PCell, and the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.2.2.4.2 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 14.6.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 14.6.2.2.4.3.

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 Tables 14.6.2.2.5-2 and 14.6.2.2.5-3 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 14.6.2.2.5-1 as appropriate and repeat steps 5-7.

14.6.2.2.4.3 Message contents

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

Table 14.6.2.2.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |
| --- | --- |
| 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  Table H.3.1-5  Table H.3.1-7 with condition INTER-FREQ  Table H.3.1-6 with condition Pattern #0  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

Table 14.6.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

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

14.6.2.2.5 Test requirement

Table 14.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 14.6.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.2.2.5-2 and the relative accuracy requirements in Table 14.6.2.2.5-3, correspondingly.

Table 14.6.2.2.5-1: Cell specific test parameters for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | | Config 1,2 | |  | FDD | | | | | | | | | | | | | | |
| BWchannel | | Config 1,2 | | MHz | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Gap pattern ID | | Config 1,2 | |  | 0 | | | | | | | | | | | | | | |
| BWP BW | | Config 1,2 | |  | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| DRX Cycle | | | | ms | Not Applicable | | | | | | | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1,2 | |  | SR.1.1 FDD | - | | | SR.1.1 FDD | | | - | | | SR.1.1 FDD | | | - | |
| RMSI CORESET Reference Channel | | Config 1,2 | |  | CR.1.1 FDD | - | | | R.1.1 FDD | | | - | | | CR.1.1 FDD | | |  | |
| Dedicated CORESET Reference Channel | | Config 1,2 | |  | CCR.1.1 FDD | - | | | CCR.1.1 FDD | | | - | | | CCR.1.1 FDD | | | - | |
| TRS Configuration | | Config 1,2 | |  | TRS.1.1 FDD | - | | | TRS.1.1 FDD | | | - | | | TRS.1.1 FDD | | | - | |
| OCNG Patterns | | | |  | OCNG pattern 1 | | | | | | | | | | | | | | |
| Time offset with Cell 1 | | Config 1,2 | | ms | - | | | 3 | | - | 3 | | | - | | 3 | | | |
| SMTC configuration | | Config 1,2 | |  | SMTC pattern 2 | | | | | | | | | | | | | | |
| SSB configuration | | Config 1,2 | |  | SSB pattern 1 in FR1 | | | | | | | | | | | | | | |
| CSI-RS for tracking | | Config 1,2 | |  | TRS.1.1 FDD | | | | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | | kHz | 15 kHz | | | | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | | | 0 | | | 0 | | | 0 | | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of PBCH to PBCH DMRS | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of PDCCH DMRS to SSS | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of PDSCH DMRS to SSS | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of PDSCH to PDSCH | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |  |  |  | | |  | | |  | | |  | | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |  |  |  | | |  | | |  | | |  | | |  | |
| Note2 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/15kHz | -80.18+TT | | | | -106+TT | | | | | | -116+TT | | | | |
| Note2 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/15kHz | -80.18+TT | | | | -106+TT | | | | | | -116+TT | | | | |
|  | | | | dB | -1.75 | | | | -1.75 | | | | | | 3 | | | -1.75 | |
|  | | | | dB | -1.75+TT | | | | -1.75+TT | | | | | | 3+TT | | | -1.75+TT | |
| SS-RSRPNote3 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/SCS | -81.93+TT | -81.93+TT | | | -107.75+TT | | | -107.75+TT | | | -113+TT | | | | -117.75+TT |
| SS-RSRQNote3 | | | NR\_FDD\_SAB\_FR1\_A | dB | -14.77+TT | -14.77+TT | | | -14.76+TT | | | -14.76+TT | | | -12.56+TT | | | | -14.76+TT |
| IoNote3 | Config 1,2 | | NR\_FDD\_SAB\_FR1\_A | dBm/9.36MHz | -50 | | | | -75.83 | | | | | | -83.28 | | | | -85.83 |
| Propagation condition | | | | - | AWGN | AWGN | | | AWGN | | | AWGN | | | AWGN | | | AWGN | |
| Antenna configuration | | | |  | 1x2 | 1x2 | | | 1x2 | | | 1x2 | | | 1x2 | | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3A.4.1A. | | | | | | | | | | | | | | | | | | | |

Table 14.6.2.2.5-2: SS-RSRQ Inter frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

Table 11.6.1.1.5-3: SS-RSRQ Inter frequency relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ\_x - FFS | SS-RSRQ\_x - FFS |
| Highest reported value (Cell 2) | SS-RSRQ\_x + FFS | SS-RSRQ\_x + FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ\_x - FFS | SS-RSRQ\_x - FFS |
| Highest reported value (Cell 2) | SS-RSRQ\_x + FFS | SS-RSRQ\_x + 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%.

### 14.6.3 SS-SINR Requirements for SAN

#### 14.6.3.0 Minimum conformance requirements

##### 14.6.3.0.1 Intra-Frequency SS-SINR accuracy requirements in FR1

14.6.3.0.1.1 Absolute SS-SINR accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 14.6.3.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.2 for a corresponding Band.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.3.0.1.1-1: SS-SINR Intra frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  | Note 3 | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±[3] | ±[4] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±[3.5] | ±[4] | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB under non-HST scenarios.  NOTE 4: NR operating band groups for satellite access in FR1 are as defined in clause 3A.4.1A.  NOTE 5: The requirements apply for SSB Ês/Iot ≤5 dB with SCS 15kHz or 30kHz under NR high speed scenarios. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.12C.1.1.

##### 14.6.3.0.2 Inter-Frequency SS-SINR accuracy requirements in FR1

14.6.3.0.2.1 Absolute SS-SINR accuracy

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 14.6.3.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.3 for a corresponding Band.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.3.0.2.1-1: SS-SINR Inter frequency absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 3 | Io Note 1 range | | | | |
|  |  | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±[3] | ±[4] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±[3.5] | ±[4] | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.14C.1.1.

14.6.3.0.2.2 Relative SS-SINR accuracy

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR1 compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 14.6.3.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.3 for a corresponding Band.

- |SSB\_RP1dBm - SSB\_RP2dBm| ≤ 27 dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.3.0.2.2-1: SS-SINR Inter frequency relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  | Note 2,4 | NR operating band groups Note 5 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 120 kHz | SCSSSB = 240 kHz |  |  |
| ±[3.5] | ±[4] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| ±[4] | ±[4] | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 4: The requirements apply for SSB Ês/Iot ≤ [25] dB.  NOTE 5: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.14C.1.2.

#### 14.6.3.1 NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

Editor's Note:

* Undefined Satellite band groups need to be removed in 38.133

14.6.3.1.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.3.0.1.

14.6.3.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and SS-SINR measurements in FR1.

14.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.3.1.

14.6.3.1.4 Test description

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table 14.6.3.1.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 14.6.3.1.5-1. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

14.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.3.1.4.1-1.

Table 14.6.3.1.4.1-1: Supported test configurations for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.6.3.1-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.3.1-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 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 14.6.3.1.4.1-2

Table 14.6.3.1.4.1-2: Initial conditions for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | NA | |  |

1. The general test parameter settings are set up according to Table 14.6.3.1.4.1-3.

2. Message contents are defined in clause 14.6.3.1.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.3.1.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.6.3.1.5-1.

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. Cell 1 is the active cell.

2. Set the parameters according to Table 14.6.3.1.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic SS-SINR measurements on the UE.

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

5. The UE shall transmit periodic *MeasurementReport* messages.

6. After 10s wait from Step 4, 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 14.6.3.1.5-2 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 14.6.3.1.5-1 as appropriate and repeat steps 5-7.

14.6.3.1.4.3 Message contents

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

Table 14.6.3.1.4.3-1: Common Exception messages for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| 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 SS-SINR  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ and SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

Table 14.6.3.1.4.3-2: *ReportConfigNR* for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrp | false |  |  |
| rsrq | false |  |  |
| sinr | true |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.6.3.1.5 Test requirements

Table 14.6.3.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access. Table 14.6.3.1.5-2 defines the requirement that the SS-SINR values contained in the *MeasurementReport* shall meet.

Table 14.6.3.1.5-1: Cell specific parameters for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | |
|  | | |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | |  | freq1 | | freq1 | |
| Duplex mode | | Config 1, 2 |  | FDD | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | |
| TRS configuration | | Config 1, 2 |  | TRS.1.1 FDD |  | TRS.1.1 FDD |  |
| PDSCH Reference measurement channel | | Config 1, 2 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.1.1 FDD | - | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| OCNG Patterns | | |  | OP.1 | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | |
| SMTC configuration | | Config 1, 2 |  | SMTC.2 | | | |
| Time offset with Cell 1 | | Config 1, 2 | ms | - | 3 | - | 3 |
| SSB configuration | | Config 1, 2 |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 15 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  |
| Note2 | | NR\_FDD\_SAB\_FR1\_A, | dBm/15kHz | -93 | | -116 | |
|  | | NR\_FDD\_SAB\_FR1\_B |  |  | | -115.5+TT | |
|  | | NR\_FDD\_SAB\_FR1\_C |  |  | | -115+TT | |
|  | | NR\_FDD\_SAB\_FR1\_D |  |  | | -114.5+TT | |
|  | | NR\_FDD\_SAB\_FR1\_E |  |  | | -114+TT | |
|  | | NR\_FDD\_SAB\_FR1\_F, |  |  | | -113.5+TT | |
|  | | NR\_FDD\_SAB\_FR1\_G |  |  | | -113+TT | |
|  | | NR\_FDD\_SAB\_FR1\_H |  |  | | -112.5+TT | |
|  | | NR\_FDD\_SAB\_FR1\_I |  |  | | -112+TT | |
|  | | NR\_FDD\_SAB\_FR1\_J |  |  | | -111.5+TT | |
| Note2 | Config 1, 2 | | dBm/SCS | -93 | | Same as Noc for 15kHz | |
|  | | | dB | 0 | -3.19 | -5.10 | -5.10 |
|  | | | dB | 4.54 | 2.66 | -3.50 | -3.50 |
| SS-RSRPNote3 | Config 1, 2 | NR\_FDD\_SAB\_FR1\_A, | dBm/SCS | -88.46 | -90.34 | -119.50 | -119.50 |
|  |  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -119.5+TT | -119.5+TT |
|  |  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -119+TT | -119+TT |
|  |  | NR\_FDD\_SAB\_FR1\_D |  |  |  | -118.5+TT | -118.5+TT |
|  |  | NR\_FDD\_SAB\_FR1\_E |  |  |  | -118+TT | -118+TT |
|  |  | NR\_FDD\_SAB\_FR1\_F, |  |  |  | -117.5+TT | -117.5+TT |
|  |  | NR\_FDD\_SAB\_FR1\_G |  |  |  | -117+TT | -117+TT |
|  |  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -116.5+TT | -116.5+TT |
|  |  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -116+TT | -116+TT |
|  |  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -115.5+TT | -115.5+TT |
| SS-SINR Note3 | | NR\_FDD\_SAB\_FR1\_A, | dB | 0 | -3.19 | -5.10 | -5.10 |
|  | | NR\_FDD\_SAB\_FR1\_B |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_C |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_D |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_E |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_F, |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_G |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_H |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_I |  |  |  |  |  |
|  | | NR\_FDD\_SAB\_FR1\_J |  |  |  |  |  |
| IoNote3 | Config 1, 2 | NR\_FDD\_SAB\_FR1\_A, | dBm/  9.36MHz | -57.50 | | -85.28 | |
|  |  | NR\_FDD\_SAB\_FR1\_B |  |  | | -85.01+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_C |  |  | | -84.51+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_D |  |  | | -84.01+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_E |  |  | | -83.51+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_F, |  |  | | -83.01+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_G |  |  | | -82.51+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_H |  |  | | -82.01+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_I |  |  | | -81.51+TT | |
|  |  | NR\_FDD\_SAB\_FR1\_J |  |  | | -81.01+TT | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3A.4.1A. | | | | | | | |

Table 14.6.3.1.5-2: SS-SINR Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-SINR\_31 | SS-SINR\_28 |
| Highest reported value (Cell 2) | SS-SINR\_49 | SS-SINR\_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-SINR\_30 | SS-SINR\_27 |
| Highest reported value (Cell 2) | SS-SINR\_50 | SS-SINR\_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 14.6.3.2 NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

Editor's Note:

* Undefined Satellite band groups need to be removed in 38.133

14.6.3.2.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.3.0.2.

14.6.3.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and SS-SINR measurements in FR1.

14.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.3.2.

14.6.3.2.4 Test description

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table 14.6.3.2.4.1-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table 14.6.3.2.5-1. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

14.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.3.2.4.1-1.

Table 14.6.3.2.4.1-1: Supported test configurations for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.6.3.2-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.3.2-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 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 14.6.3.2.4.1-2

Table 14.6.3.2.4.1-2: Initial conditions for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.3.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and φ1 = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | NA | |  |

1. The general test parameter settings are set up according to Table 14.6.3.2.4.1-3.

2. Message contents are defined in clause 14.6.3.2.4.3.

3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.3.2.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.6.3.2.5-1.

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. Cell 1 is the active cell.

2. Set the parameters according to Table 14.6.3.2.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic SS-SINR measurements on the UE.

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

5. The UE shall transmit periodic *MeasurementReport* messages.

6. After 10s wait from Step 4, 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 14.6.3.2.5-2 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 14.6.3.2.5-1 as appropriate and repeat steps 5-7.

14.6.3.2.4.3 Message contents

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

Table 14.6.3.2.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| 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 INTER-FREQ MO and SS-SINR  Table H.3.1-5  Table H.3.1-6 with Condition Pattern #0  Table H.3.1-7 with Condition INTER-FREQ and SINR  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

Table 14.6.3.2.4.3-2: *ReportConfigNR* for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| periodical SEQUENCE { |  |  | PERIODICAL |
| reportQuantityCell SEQUENCE { |  |  |  |
| rsrp | false |  |  |
| rsrq | false |  |  |
| sinr | true |  |  |
| } |  |  |  |
| maxReportCells | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

14.6.3.2.5 Test requirements

Table 14.6.3.2.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access. Table 14.6.3.2.5-2 and 14.6.3.2.5-3 define the absolute and relative requirements, correspondingly, that the SS-SINR values contained in the *MeasurementReport* shall meet.

Table 14.6.3.2.5-1: Cell specific parameters for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | | Config 1, 2 |  | FDD | | | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | | | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | | | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | | | |
| Gap pattern ID | | |  | 0 | - | 0 | - | 0 | | - | |
| TRS configuration | | Config 1, 2 |  | TRS.1.1 FDD |  | TRS.1.1 FDD |  | | TRS.1.1 FDD | |  |
| PDSCH Reference measurement channel | | Config 1, 2 |  | SR.1.1 FDD | - | SR.1.1 FDD | - | | SR.1.1 FDD | | - |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.1.1 FDD | - | CR.1.1 FDD | - | | CR.1.1 FDD | |  |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - | | CCR.1.1 FDD | | - |
| OCNG Patterns | | |  | OP.1 | | | | | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | | | | | |
| Time offset with Cell 1 | | Config 1, 2 | ms | - | 3 | - | 3 | - | | 3 | |
| SMTC configuration | | Config 1, 2 |  | SMTC pattern 2 | | | | | | | |
| SSB configuration | | Config 1, 2 |  | SSB.1 FR1 | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 15 | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  | |  | |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  | |  | |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  | |  | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  | |  | |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  | |  | |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  | |  | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  | |  | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  | |  | |  |
| Note2 | Config 1, 2 | NR\_FDD\_SAB\_FR1\_A, | dBm/15kHz | -88 | | -108.5 | | | -119.5 | | |
|  |  | NR\_FDD\_SAB\_FR1\_B |  |  | |  | | | -119+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_C |  |  | |  | | | -118.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_D |  |  | |  | | | -118+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_E |  |  | |  | | | -117.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_F, |  |  | |  | | | -117+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_G |  |  | |  | | | -116.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_H |  |  | |  | | | -116+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_I |  |  | |  | | | -115.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_J |  |  | |  | | | -115+TT | | |
| Note2 | Config 1, 2 | | dBm/SCS | -88 | | -108.5 | | | Same as Noc for 15kHz | | |
|  |  | |  |  | |  | | |  | | |
|  |  | |  |  | |  | | |  | | |
|  |  | |  |  | |  | | |  | | |
|  |  | |  |  | |  | | |  | | |
|  |  | |  |  | |  | | |  | | |
|  |  | |  |  | |  | | |  | | |
|  |  | |  |  | |  | | |  | | |
|  | | | dB | -1.75 | -1.75 | 20 | 20 | | -2.1 | | -2.1 |
|  | | | dB | -1.75 | | 20 | | | -2.1 | | |
| SS-RSRP Note3 | Config 1, 2 | NR\_FDD\_SAB\_FR1\_A, | dBm/SCS | -89.75 | | -88.50 | | | -121.60 | | |
|  |  | NR\_FDD\_SAB\_FR1\_B |  |  | |  | | | -123+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_C |  |  | |  | | | -122.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_D |  |  | |  | | | -122+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_E |  |  | |  | | | -121.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_F, |  |  | |  | | | -121+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_G |  |  | |  | | | -120.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_H |  |  | |  | | | -120+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_I |  |  | |  | | | -119.5+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_J |  |  | |  | | | -119+TT | | |
| SS-SINRNote3 | | NR\_FDD\_SAB\_FR1\_A, | dB | -1.75 | | 20 | | | -2.10 | | |
|  | | NR\_FDD\_SAB\_FR1\_B |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_C |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_D |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_E |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_F, |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_G |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_H |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_I |  |  | |  | | |  | | |
|  | | NR\_FDD\_SAB\_FR1\_J |  |  | |  | | |  | | |
| IoNote3 | Config 1, 2 | NR\_FDD\_SAB\_FR1\_A, | dBm/  9.36MHz | -57.83 | | -60.50 | | | -89.46 | | |
|  |  | NR\_FDD\_SAB\_FR1\_B |  |  | |  | | | -89.59+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_C |  |  | |  | | | -89.09+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_D |  |  | |  | | | -88.59+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_E |  |  | |  | | | -88.09+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_F, |  |  | |  | | | -87.59+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_G |  |  | |  | | | -87.09+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_H |  |  | |  | | | -86.59+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_I |  |  | |  | | | -86.09+TT | | |
|  |  | NR\_FDD\_SAB\_FR1\_J |  |  | |  | | | -85.59+TT | | |
| Propagation condition | | | - | AWGN | | | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3A.4.1A. | | | | | | | | | | | |

Table 14.6.3.2.5-2: Reported SS-SINR Intra frequency absolute accuracy requirements for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | |  |
| Lowest reported value (Cell 2) | SS-SINR\_35 | SS-SINR\_79 | SS-SINR\_34 |
| Highest reported value (Cell 2) | SS-SINR\_51 | SS-SINR\_94 | SS-SINR\_51 |
| Extreme Conditions | | |  |
| Lowest reported value (Cell 2) | SS-SINR\_33 | SS-SINR\_77 | SS-SINR\_33 |
| Highest reported value (Cell 2) | SS-SINR\_53 | SS-SINR\_96 | SS-SINR\_52 |

Table 14.6.3.2.5-3: Reported SS-SINR Intra frequency relative accuracy requirements for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | All bands | All bands | All bands |
| Normal Conditions | | |  |
| Lowest reported value (Cell 2) | SS-SINR\_x - 10 | SS-SINR\_x - 10 | SS-SINR\_x - 11 |
| Highest reported value (Cell 2) | SS-SINR\_x + 10 | SS-SINR\_x + 10 | SS-SINR\_x + 11 |
| Extreme Conditions | | |  |
| Lowest reported value (Cell 2) | SS-SINR\_x - 11 | SS-SINR\_x - 11 | SS-SINR\_x - 11 |
| Highest reported value (Cell 2) | SS-SINR\_x + 11 | SS-SINR\_x + 11 | SS-SINR\_x + 11 |

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%.

### 14.6.4 L1-RSRP Beam Reporting Measurement Requirements for SAN

#### 14.6.4.0 Minimum conformance requirements

##### 14.6.4.0.1 Minimum conformance requirements for SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_SSB\_SAN.

The value of TL1-RSRP\_Measurement\_Period\_SSB\_SAN is defined in Table 14.6.4.0.1-1 for FR1, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- P value for SSB resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any SSB resource occasion:

- Ntotal is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction-r17* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target SSB.

- Psharing factor = 3.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 14.6.4.0.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB\_SAN for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB\_SAN (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.5C.4.1.

14.6.4.0.1.1 Absolute SSB based L1-RSRP accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 14.6.4.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.19 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.4.0.1.1-1: SSB based L1-RSRP absolute accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±[5] | ±[9.5] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -70 |
| ±[8.5] | ±[11.5] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.1.1.

14.6.4.0.1.2 Relative SSB based L1-RSRP accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 14.6.4.0.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.19 for a corresponding Band for each relevant SSB.

- Valid information for the SAN serving the target cell has been provided.

Table 14.6.4.0.1.2-1: SSB based L1-RSRP relative accuracy in FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
|  |  |  | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB |  | dBm / SCSSSB | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |  |
| ±[3] | ±[4] | ≥-3 | NR\_FDD\_SAB\_FR1\_A | -121 | -118 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.  NOTE 3: Void  NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.1.2.

##### 14.6.4.0.2 Minimum conformance requirements for CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN.

The value of TL1-RSRP\_Measurement\_Period\_CSI-RS is defined in Table 14.6.4.0.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- P value for a CSI-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CSI-RS resource occasion:

- Ntotal is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction-r17* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

- TL1 is periodicity of the target CSI-RS.

- Psharing factor = 3.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP 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 14.6.4.0.2-1: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN (ms) |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.5C.4.2.

14.6.4.0.2.1 Absolute CSI-RS based L1-RSRP accuracy

FFS

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.2.1.

14.6.4.0.2.2 Relative CSI-RS based L1-RSRP accuracy

FFS

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.2.2.

#### 14.6.4.1 NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

Editor's Note:

- Accuracy requirements are in brackets in 38.133

- Undefined Satellite band groups need to be removed in 38.133

14.6.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.4.0.1.

14.6.4.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access in FR1.

14.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.4.1.

14.6.4.1.4 Test description

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table 14.6.4.1.5-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table 14.6.4.1.5-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

14.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.4.1.4.1-1.

Table 14.6.4.1.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.6.4.1-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.4.1-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 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 14.6.4.1.4.1-2

Table 14.6.4.1.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.6.4.1.4.1-3.

2. Message contents are defined in clause 14.6.4.1.4.3.

3. Cell 1 is an NR cell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is a satellite access cell.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.4.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in Table 14.6.4.1.5-1.

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. Cell 1 is the active cell.

2. Set the parameters according to Table 14.6.4.1.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic SSB based L1-RSRP measurements on the UE.

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

5. The UE shall transmit periodic L1-RSRP messages including measurements for both SSB#0 and SSB#1.

6. After 10s wait from Step 4, the SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the reported SSBs is within the limits in Table 14.6.4.1.5-2 and Table 14.6.4.1.5-3, the number of passed iterations is increased by one. If the values are outside the limits in Table 14.6.4.1.5-2 or Table 14.6.4.1.5-3, the number of failed iterations is increased by one.

7. The SS shall continue checking the reported L1-RSRP measurements 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 14.6.4.1.5-1 as appropriate and repeat steps 5-7.

14.6.4.1.4.3 Message contents

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

Table 14.6.4.1.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP  Table H.3.6-3 with conditions SSB and PERIODIC  Table H.3.6-10  Table H.3.5-8  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.6.4.1.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

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

14.6.4.1.5 Test requirements

Table 14.6.4.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access. Table 14.6.4.1.5-2 and Table 14.6.4.1.5-3 define the absolute and relative accuracy, respectively, that the L1-RSRP shall meet.

Table 14.6.4.1.5-1: Cell specific parameters for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | | 1, 2 |  | freq1 | freq1 |
| Duplex mode | | 1, 2 |  | FDD | FDD |
| TDD Configuration | | 1, 2 |  | N/A | N/A |
| BWchannel | | 1, 2 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| PDSCH Reference measurement channel | | 1, 2 |  | SR.1.1 FDD | SR.1.1 FDD |
| RMSI CORESET Reference Channel | | 1, 2 |  | CR.1.1 FDD | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | 1, 2 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| SSB configuration | | 1, 2 |  | SSB.3 FR1 | SSB.3 FR1 |
| 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 |
| TRS configuration | | 1, 2 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| Dedicated BWP configuration | | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| 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 |  | slot80 | slot80 |
| 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 | |  |  |  |  |
| Note2 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/15kHz | -94.65 | -117 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -116.5+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -116+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -115.5+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -115+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -114.5+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -114+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -113.5+TT |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1, 2 | dBm/SSB SCS | -94.65 | -117 |
|  | NR\_FDD\_FR1\_B |  |  |  | -116.5+TT |
|  | NR\_TDD\_FR1\_C |  |  |  | -116+TT |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | -115.5+TT |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | -115+TT |
|  | NR\_FDD\_FR1\_F |  |  |  | -114.5+TT |
|  | NR\_FDD\_FR1\_G |  |  |  | -114+TT |
|  | NR\_FDD\_FR1\_H |  |  |  | -113.5+TT |
|  | NR\_FDD\_FR1\_N |  |  |  | -110.5+TT |
|  | | 1, 2 | dB | 10 | -2.2 |
| SSB RSRP Note3 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/SSB SCS | -84.65 | -119.20 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -119.5+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -119+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -118.5+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -118+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -117.5+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -117+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -116.5+TT |
| Io Note3 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/9.36 MHz | -56.28 | -87.00 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -86.78+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -86.28+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -85.78+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -85.28+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -84.78+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -84.28+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -83.78+TT |
|  | | 1, 2 | dB | 10 | -2.2 |
| Propagation condition | | 1, 2 |  | AWGN | AWGN |
| Antenna configuration | | 1, 2 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |

Table 14.6.4.1.5-2: L1-RSRP absolute accuracy requirements for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 1) | 62 | 31 |
| Highest reported value (Cell 1) | 82 | 44 |
| Extreme Conditions | | |
| Lowest reported value (Cell 1) | 59 | 26 |
| Highest reported value (Cell 1) | 85 | 49 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

Table 14.6.4.1.5-3: L1-RSRP relative accuracy requirements for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | [All bands] |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

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%.

#### 14.6.4.2 NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

Editor's Note:

- Accuracy requirements are in brackets in 38.133

- Undefined Satellite band groups need to be removed in 38.133

14.6.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.4.0.2.

14.6.4.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access in FR1.

14.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.4.2.

14.6.4.2.4 Test description

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table 14.6.4.2.5-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table 14.6.4.2.5-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM, BFD based on SSB#0 and SSB$1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

14.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.4.2.4.1-1.

Table 14.6.4.2.4.1-1: Supported test configurations for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| Configuration | Description |
| 14.6.4.2-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.4.2-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 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 14.6.4.2.4.1-2

Table 14.6.4.2.4.1-2: Initial conditions for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| 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.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.4.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |

1. The general test parameter settings are set up according to Table 14.6.4.2.4.1-3.

2. Message contents are defined in clause 14.6.4.2.4.3.

3. Cell 1 is an NR cell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is a satellite access cell.

4. The initial test environment conditions are setup according to section 14.0.5.

14.6.4.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in Table 14.6.4.2.5-1.

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. Cell 1 is the active cell.

2. Set the parameters according to Table 14.6.4.2.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic CSI-RS based L1-RSRP measurements on the UE.

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

5. The UE shall transmit periodic L1-RSRP messages including measurements for both CSI-RS#0 and CSI-RS#1.

6. After 10s wait from Step 4, the SS shall check the L1-RSRP reported values of CSI-RS#0 or CSI-RS#1 in the periodic L1-RSRP reports. If the value for the reported CSI-RSs is within the limits in Table 14.6.4.2.5-2 and Table 14.6.4.2.5-3, the number of passed iterations is increased by one. If the values are outside the limits in Table 14.6.4.2.5-2 or Table 14.6.4.2.5-3, the number of failed iterations is increased by one.

7. The SS shall continue checking the reported L1-RSRP measurements 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 14.6.4.2.5-1 as appropriate and repeat steps 5-7.

14.6.4.2.4.3 Message contents

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

Table 14.6.4.2.4.3-1: Common Exception messages for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and CSI-RSRP  Table H.3.6-3 with conditions CSI-RS and PERIODIC  Table H.3.6-10  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 14.6.4.2.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

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

14.6.4.2.5 Test requirements

Table 14.6.4.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access. Table 14.6.4.2.5-2 and Table 14.6.4.2.5-3 define the absolute and relative accuracy, respectively, that the L1-RSRP shall meet.

Table 14.6.4.2.5-1: Cell specific parameters for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | | 1, 2 |  | freq1 | freq1 |
| Duplex mode | | 1, 2 |  | FDD | FDD |
| TDD Configuration | | 1, 2 |  | N/A | N/A |
| BWchannel | | 1, 2 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| PDSCH Reference measurement channel | | 1, 2 |  | SR.1.1 FDD | SR.1.1 FDD |
| RMSI CORESET Reference Channel | | 1, 2 |  | CR.1.1 FDD | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | 1, 2 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| SSB configuration | | 1, 2 |  | SSB.3 FR1 | SSB.3 FR1 |
| OCNG Patterns | | 1, 2 |  | OP.1 | OP.1 |
| TRS configuration | | 1, 2 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| Initial BWP Configuration | | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1, 2 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1, 2 |  | SMTC.1 | SMTC.1 |
| CSI-RS | | 1, 2 |  | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| reportConfigType | | 1, 2 |  | periodic | periodic |
| reportQuantity | | 1, 2 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | | 1, 2 |  | 2 | 2 |
| L1-RSRP reporting period | | 1, 2 |  | slot80 | slot80 |
| 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 | |  |  |  |  |
| Note2 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/15kHz | -94.65 | -117 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -116.5+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -116+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -115.5+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -115+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -114.5+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -114+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -113.5+TT |
| Note2 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/CSI-RS SCS | -94.65 | -117 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -116.5+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -116+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -115.5+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -115+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -114.5+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -114+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -113.5+TT |
|  | | 1, 2 | dB | 10 | -2.20 |
| CSI-RS RSRP Note3 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/CSI-RS SCS | -84.65 | -119.20 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -119.5+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -119+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -118.5+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -118+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -117.5+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -117+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -116.5+TT |
| Io Note3 | NR\_FDD\_SAB\_FR1\_A | 1, 2 | dBm/9.36 MHz | -56.28 | -87.00 |
|  | NR\_FDD\_SAB\_FR1\_B |  |  |  | -86.78+TT |
|  | NR\_FDD\_SAB\_FR1\_C |  |  |  | -86.28+TT |
|  | NR\_FDD\_SAB\_FR1\_D NR\_FDD\_SAB\_FR1\_E |  |  |  | -85.78+TT |
|  | NR\_FDD\_SAB\_FR1\_F NR\_FDD\_SAB\_FR1\_G |  |  |  | -85.28+TT |
|  | NR\_FDD\_SAB\_FR1\_H |  |  |  | -84.78+TT |
|  | NR\_FDD\_SAB\_FR1\_I |  |  |  | -84.28+TT |
|  | NR\_FDD\_SAB\_FR1\_J |  |  |  | -83.78+TT |
|  | | 1, 2 | dB | 10 | -2.2 |
| Propagation condition | | 1, 2 |  | AWGN | AWGN |
| Antenna configuration | | 1, 2 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |

Table 14.6.4.2.5-2: L1-RSRP absolute accuracy requirements for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value | 62 | 31 |
| Highest reported value | 82 | 44 |
| Extreme Conditions | | |
| Lowest reported value | 59 | 26 |
| Highest reported value | 85 | 49 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

Table 14.6.4.2.5-3: L1-RSRP relative accuracy requirements for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

|  |  |  |
| --- | --- | --- |
|  | Test 1 | Test 2 |
|  | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

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%.

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