# 6 NR standalone in FR1

## 6.0 General

This clause contains test scenarios for NR standalone. This configuration is also known as NR/5GC. All NR cells are in Frequency Range 1.

## 6.1 RRC\_IDLE state mobility

### 6.1.1 NR cell re-selection

#### 6.1.1.0 Minimum conformance requirements

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The parameter Kcarrier is the number of NR inter-frequency carriers which are not configured with *highSpeedMeasInterFreq-r17* for FR1 indicated by the serving cell. The parameter Kcarrier\_HST is the number of NR inter-frequency carriers which are configured with *highSpeedMeasInterFreq-r17* for FR1 indicated by the serving cell. The parameter Kcarrier for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are not configured with *highSpeedMeasInterFreq-r17* for FR1. The parameter Kcarrier\_HST for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are configured with *highSpeedMeasInterFreq-r17* for FR1.

Note: combined total number means that if a carrier is an inter-frequency carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.3 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 Kcarrier \* Tmeasure,NR\_Inter + Kcarrier\_HST \* Tmeasure,NR\_Inter\_HST (see table 6.1.1.0.2-1 and table 6.1.1.0.2-2 if UE declares support of idle mode inter-frequency measurement enhancement when configured with highSpeedMeasInterFreq-r17 for FR1, otherwise see table 6.1.1.0.2-1 only of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,NR\_Inter/2 for carriers which are not configured with highSpeedMeasInterFreq-r17 for FR1or Tmeasure,NR\_Inter\_HST /2 for carriers which are configured with highSpeedMeasInterFreq-r17 forFR1.

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

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within

Kcarrier \* Tevaluate,NR\_Inter + Kcarrier\_HST \* Tevaluate,NR\_Inter\_HST when Treselection = 0as specified in table 6.1.1.0.2-1 and table 6.1.1.0.2-2 in TS 38.133 [6] if UE declares support of idle mode inter-frequency measurement enhancement when configured with *highSpeedMeasInterFreq-r17* for FR1, otherwise see table 6.1.1.0.2-1 only, 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 5dB better ranked in FR1 or 6.5dB better ranked in FR2 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 TS38.304 [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 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them. or

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

- 4dB 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 6.1.1.0.2-1 of TS 38.133 [6] under the following conditions:

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

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier, and

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

**Table 6.1.1.0.2-1: 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** | **FR2-1Note1** | **FR2-2** Note2 |
| 0.32 | 1 | 8 | 12 | 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 |  | 5 | 8 | 17.92x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 |  | 4 | 6 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 |  | 3 | 5 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length.  Note 2: Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length. | | | | | | |

Table 6.1.1.0.2-2: Tdetect,NR\_Inter\_HST, Tmeasure,NR\_Inter\_HST and Tevaluate,NR\_Inter\_HST for FR1 configured with *highSpeedMeasInterFreq-r17* note2

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter\_HST [s] (number of DRX cycles) | Tmeasure,NR\_Inter\_HST [s] (number of DRX cycles) | Tevaluate,NR\_Inter\_HST [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  Note 2: The support of HST Idle mode inter-frequency measurement enhancement is optional without capability signalling. Apply for UE declaring supports idle mode inter-frequency measurement enhancement for HST, otherwise Table 6.1.1.0.2-1 shall be used. | | | |

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

##### 6.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with highSpeedMeasFlag-r16

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

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

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within Tdetect,NR\_Intraas defined in table 4.2.2.3-2 of TS 38.133 [6] when that Treselection= 0*.* An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every Tmeasure,NR\_Intra (see table 4.2.2.3-2 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within Tevaluate,NR\_Intra when Treselection = 0as specified in table 4.2.2.3-2 of TS 38.133 [6] provided that the cell has at least 3dB better ranked.

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

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

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

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

[TS 38.133, clause 4.2.2.3]

An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every Tmeasure,NR\_Intra for intra-frequency cells that are identified and measured according to the measurement rules.

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS38.304 [1] within Tevaluate,NR\_Intra when Treselection = 0provided that:

when *rangeToBestCell* is not configured:

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

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

[TS 38.133, clause 4.2.2.9.2]

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

- UE is configured with *lowMobilityEvalutation* [2] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and UE has fulfilled only the *lowMobilityEvalutation* [2] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- Tdetect,NR\_Intraas specified in Table 4.2.2.9.2-1.

- Tmeasure,NR\_Intra as specified in Table 4.2.2.9.2-1.

- Tevaluate,NR\_Intra as specified in Table 4.2.2.9.2-1.

Table 4.2.2.9.2-1: 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 | FR2Note1 |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1) | 1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1) | 5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1) |
| 0.64 |  | 5 | 17.92 x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 |  | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 |  | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.  Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion. | | | | | |

[TS 38.133, clause 4.2.2.9.3]

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

- UE is configured with *cellEdgeEvaluation* [2] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criteria and *combineRelaxedMeasCondition* [2] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- Tdetect,NR\_Intraas specified in Table 4.2.2.9.3-1.

- Tmeasure,NR\_Intra as specified in Table 4.2.2.9.3-1.

- Tevaluate,NR\_Intra as specified in Table 4.2.2.9.3-1.

Table 4.2.2.9.3-1: 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 | FR2Note1 |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1) | 1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1) | 5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1) |
| 0.64 |  | 5 | 17.92 x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 |  | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 |  | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.  Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. | | | | | |

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum SSB\_RP | | SSB Ês/Iot |
| dBm / SCSSSB | | dB |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| **Conditions** | Depending on band group | -124+ ΔBG\_offset | -121+ ΔBG\_offset | ≥ -4 |
| NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2.  NOTE 2: For NR operating band groups, ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | |

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

[TS 38.133, clause 4.2.2.4]

An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 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 Kcarrier \* Tmeasure,NR\_Inter for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

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

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

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

- the condition when performing equal priority reselection and

- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities

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

[TS 38.133, clause 4.2.2.10.2]

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

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

- UE is configured with *lowMobilityEvalutation* [2] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvalutation* [2] and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and

- UE has fulfilled only the *lowMobilityEvalutation* [2] criterion.

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

- Tdetect,NR\_Interas specified in Table 4.2.2.10.2-1.

- Tmeasure,NR\_Inter as specified in Table 4.2.2.10.2-1.

- Tevaluate,NR\_Inter as specified in Table 4.2.2.10.2-1.

Table 4.2.2.10.2-1: Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DRX cycle length [s] | Scaling Factor (N1) | | Tdetect,NR\_Inter [s] (number of DRX | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter [s] (number of DRX cycles) |
|  | FR1 | FR2Note1 | cycles) |  |  |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1) | 1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1) | 5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1) |
| 0.64 |  | 5 | 17.92x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 |  | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 |  | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility. | | | | | |

[TS 38.133, clause 4.2.2.10.3]

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

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

- UE is configured with *cellEdgeEvaluation* [2] criterion, and UE has fulfilled or

- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and

- UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

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

- Tdetect,NR\_Interas specified in Table 4.2.2.10.3-1.

- Tmeasure,NR\_Inter as specified in Table 4.2.2.10.3-1.

- Tevaluate,NR\_Inter as specified in Table 4.2.2.10.3-1.

Table 4.2.2.10.3-1: Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DRX cycle length [s] | Scaling Factor (N1) | | Tdetect,NR\_Inter [s] (number of DRX | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter [s] (number of DRX cycles) |
|  | FR1 | FR2Note1 | cycles) |  |  |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1) | 1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1) | 5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1) |
| 0.64 |  | 5 | 17.92x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 |  | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 |  | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. | | | | | |

[TS 38.133, Annex B.1.3]

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum SSB\_RP | | SSB Ês/Iot |
| dBm / SCSSSB | | dB |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| **Conditions** | Depending on band group | -124+ ΔBG\_offset | -121+ ΔBG\_offset | ≥ -4 |
| NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2.  NOTE 2: For NR operating band groups, ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | |

#### 6.1.1.1 NR SA FR1 cell re-selection

6.1.1.1.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

6.1.1.1.2 Test applicability

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

6.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.1.

6.1.1.1.4 Test description

6.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.1.4.1-1.

Table 6.1.1.1.4.1-1: Supported test configurations for NR SA FR1 cell re-selection

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 6.1.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.1.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.1.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.1.4.1-2.

Table 6.1.1.1.4.1-2: Initial conditions for NR SA FR1 cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.1.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.1.4.1-3.

2. Message contents are defined in clause 6.1.1.1.4.3.

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

Table 6.1.1.1.4.1-3: General test parameters for NR SA FR1 cell re-selection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| T2 end condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| Neighbour cells |  | 1, 2, 3 | Cell1 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cell |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | >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, 3 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

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

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 6.1.1.1.5-1. T1 starts.

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

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.1.5-1. 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 from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

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

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

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.1.5-1. 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 from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

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

11a.The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.12. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.  
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

6.1.1.1.4.3 Message contents

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

Table 6.1.1.1.4.3-1: Common Exception messages

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

Table 6.1.1.1.4.3-2: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| cellSelectionInfo SEQUENCE { | |  |  |  |
| q-RxLevMin | | -65 | -130 is actual value in dBm (-65 \* 2 dBm) | 6.1.1.1-1, 6.1.1.1-2 |
|  | | -64 | -128 is actual value in dBm (-64 \* 2 +1 dBm) | 6.1.1.1-3 |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.1.1.4.3-3: SIB2 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| q-RxLevMin | -65 | Actual value is -65\*2 = -130dBm | 6.1.1.1-1, 6.1.1.1-2 |
|  | -64 | Actual value is -64\*2 = -128dBm | 6.1.1.1-3 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 |  | 6.1.1.1-1 AND Cell 1 |
|  | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 |  | 6.1.1.1-1 AND Cell 2 |
|  | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.1-2, 6.1.1.1-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.1-1 |
|  | true |  | 6.1.1.1-2, 6.1.1.1-3 |
| } |  |  |  |
| } |  |  |  |

##### 6.1.1.1.5 Test requirement

Tables 6.1.1.1.4.1-3 and 6.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.1.1.1.5-1: Cell specific test parameters for NR SA FR1 cell re-selection

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1 | N/A | | | N/A | | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.2.1-1 | | | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -130 | | | -130 | | |
| 3 | -127 | | | -127 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2, 3 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
| 2 | -98 | | | | | |
| 3 | -95 | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| 2 |
| 3 |
|  | dB | 1 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| 2 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| 3 | -79 | -82 | -78.54 | -infinity | -78.54 | -82 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -51.91 | -51.91 | Specified in Cell 1  columns | | |
| dBm/9.36 MHz | 2 | -53.94 | -51.91 | -51.91 |
| dBm/38.16 MHz | 3 | -47.85 | -45.81 | -45.81 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | | 60 | | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *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 test requirement in this case is expressed as:

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

Tdetect,NR\_Intra = 32 s; as specified in TS 38.133 [6] clause 4.2.2.3.

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

The cell re-selection delay to a newly detectable cell shall be less than a total of 33.28 seconds in this test case (note: this gives a total of 33.28 seconds but the test allows 34 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *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 test requirement in this case is expressed as:

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

Tevaluate,NR\_Intra = 6.4 s; as specified in TS 38.133 [6] clause 4.2.2.3.

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

The cell re-selection delay to an already detected cell shall be less than a total of 7.68 seconds in this test case (note: this gives a total of 7.68 seconds but the test allows 8 seconds).

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

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

#### 6.1.1.2 NR SA FR1-FR1 cell re-selection

6.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection.

6.1.1.2.2 Test applicability

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

6.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.2.

6.1.1.2.4 Test description

6.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.2.4.1-1.

Table 6.1.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.1.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.1.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.2.4.1-2.

Table 6.1.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.2.4.1-1. | | |
| 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. The general test parameter settings are set up according to Table 6.1.1.2.4.1-3.

2. Message contents are defined in clause 6.1.1.2.4.3.

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

Table 6.1.1.2.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
| Neighbour cell |  | 1, 2, 3 | Cell1 |  |
| T1 end condition | Active cell |  | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| Neighbour cells |  | 1, 2, 3 | Cell2 |
| T3 end condition | Active cell |  | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| Neighbour cell |  | 1, 2, 3 | Cell1 |  |
| RF Channel Number | |  | 1, 2, 3 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC 2 | Configured in SIB4 of Cell 1 |
| SMTC.6 | Configured in SIB4 of Cell 2 |
| 2 | SMTC 1 |  |
| 3 | SMTC 1 |  |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

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* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 6.1.1.2.5-1. T1 starts.

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

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a.  
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 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.2.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.2.5-1. T3 starts.

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

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a.  
Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a.The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 2.

11. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.  
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

6.1.1.2.4.3 Message contents

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

Table 6.1.1.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.2-1  Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 1  Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 2  Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-2  Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-3  Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions |  |

6.1.1.2.5 Test requirement

Tables 6.1.1.2.4.1-3 and 6.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 6.1.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1 | N/A | | | N/A | | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.2.1-1 | | | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
| 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | -100 | -98 | -98 |
| 2 | -98 | | | -100 | -98 | -98 |
| 3 | -95 | | | -97 | -95 | -95 |
| Note2 | dBm/15 kHz | 1 | -98 | | | -100 | -98 | -98 |
| 2 |
| 3 |
|  | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| 2 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| 3 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 |
| Io | dBm/9.36 MHz | 1 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
| dBm/9.36 MHz | 2 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
| dBm/38.16 MHz | 3 | -48.23 | -48.23 | -48.23 | -67.37 | -infinity | -53.17 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | |
| Threshx, highP | dB | 1, 2, 3 | 48 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3 | 44 | | | 44 | | |
| Threshx, lowP | dB | 1, 2, 3 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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 T3, 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 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 Registration procedure for mobility and periodic registration updateon 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 of TS 38.133 [6]

Tevaluate, NR\_ inter See Table 4.2.2.4-1 in clause 4.2.2.4 of TS 38.133 [6]

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 and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

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

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

#### 6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

6.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.9.2.

6.1.1.3.2 Test applicability

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

6.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.3.

6.1.1.3.4 Test description

6.1.1.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.3.4.1-1.

Table 6.1.1.3.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 6.1.1.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.3-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.3.4.1-2.

Table 6.1.1.3.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.3.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.3.4.1-3.

2. Message contents are defined in clause 6.1.1.3.4.3.

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

Table 6.1.1.3.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 | The UE camps on cell 1 in the initial phase |
|  | Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| T1 end condition | Active cell |  | 1, 2, 3 | Cell2 | The UE reselects to cell 2 during T1 period |
|  | Neighbour cells |  | 1, 2, 3 | Cell1 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell1 | The UE reselects to cell 1 during T2 period |
|  | Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
|  | | 2 | 3 μs | Synchronous cells |
|  | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
|  | | 2 | SSB.1 FR1 |  |
|  | | 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC pattern 2 | Configured in SIB2 of Cell 1 |
|  | |  | SMTC pattern 6 | Configured in SIB2 of Cell 2 |
|  | | 2 | SMTC pattern 1 |  |
|  | | 3 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 25 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 25 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. 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.

Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *lowMobilityEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

SIB2 of Cell 1 and Cell 2 are configured as follows:

*- lowMobilityEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.3.5-1.

*- cellEdgeEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

1. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

2. Set the parameters according to T1 in Table 6.1.1.3.5-1. T1 starts.

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

4. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

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

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.3.5-1. T2 starts.

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

9. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1. skip to 14

12. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select 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.

6.1.1.3.4.3 Message contents

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

Table 6.1.1.3.4.3-1: Common Exception messages

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

Table 6.1.1.3.4.3-2: SIB1 (Cell 1 and Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-3 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| servingCellConfigCommon SEQUENCE { | |  |  |  |
| downlinkConfigCommon SEQUENCE { | |  |  |  |
| pcch-Config SEQUENCE { | |  |  |  |
| defaultPagingCycle | | rf64 |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.1.3.4.3-3: SIB2 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 |  | 6.1.1.3-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.3-2, 6.1.1.3-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.3-1 |
|  | true |  | 6.1.1.3-2, 6.1.1.3-3 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB6 |  |  |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.1.3.4.3-4: SIB2 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 |  | 6.1.1.3-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.3-2, 6.1.1.3-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.3-1 |
|  | true |  | 6.1.1.3-2, 6.1.1.3-3 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB6 |  |  |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

6.1.1.3.5 Test requirement

Tables 6.1.1.3.4.1-3 and 6.1.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

Table 6.1.1.3.5-1: Cell specific test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  |  | 2 | SR.1.1 TDD | |
|  |  | 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
|  |  | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
|  |  | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
|  |  | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
|  |  | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| Qhysts | dB | 1, 2, 3 | 0 | | 0 | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | 0 | |
| SSearchDeltaP | dB | 1, 2, 3 | 6 | | 6 | |
| TSearchDeltaP | s | 1, 2, 3 | 5 | | 5 | |
| Cell\_selection\_and\_ reselection\_quality\_ measurement |  | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
|  | dB | 1, 2, 3 | -3.56 | 3.22 | 3.22 | -3.56 |
| Note2 | dBm/SCS | 1 | -98 | | | |
|  |  | 2 | -98 | | | |
|  |  | 3 | -95 | | | |
| Note2 | dBm/15 kHz | 1, 2, 3 | -98 | | | |
|  | dB | 1, 2, 3 | 12.55 | 16 | 16 | 12.55 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85.45 | -82 | -82 | -85.45 |
|  |  | 2 | -85.45 | -82 | -82 | -85.45 |
|  |  | 3 | -82.45 | -79 | -79 | -82.45 |
| Io | dBm/9.36 MHz | 1 | -52.35 | -52.35 | specified in Cell 1 columns- | |
|  | dBm/9.36 MHz | 2 | -52.35 | -52.35 |
|  | dBm/38.16 MHz | 3 | -46.25 | -46.25 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | 60 | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The cell re-selection delay to detected cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 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 detected cell for UE fulfilling low mobility criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

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

Tevaluate,NR\_Intra = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.2-1.

TSI-NR = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

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

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

#### 6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.9.3.

6.1.1.4.2 Test applicability

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

6.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

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

6.1.1.4.4 Test description

6.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.4.4.1-1.

Table 6.1.1.4.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 6.1.1.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.4-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.4.4.1-2.

Table 6.1.1.4.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.4.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.4.4.1-3.

2. Message contents are defined in clause 6.1.1.4.4.3.

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

Table 6.1.1.4.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial  condition | Active Cell |  | 1, 2, 3 | Cell1 | The UE camps on Cell 1 in the initial phase |
|  | Neighbour Cells |  | 1, 2, 3 | Cell2 |
| T1 end condition | Active Cell |  | 1, 2, 3 | Cell2 | The UE shall fulfil the not-at-cell edge criterion and reselect to cell 2 during T1 period during T1. |
|  | Neighbour Cells |  | 1, 2, 3 | Cell1 |
| T2 end condition | Active Cell |  | 1, 2, 3 | Cell1 | The UE shall perform reselection to Cell 1 during T2 |
|  | Neighbour Cells |  | 1, 2, 3 | Cell2 |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between Cells | |  | 1 | 3 ms | Asynchronous Cells |
|  | | 2 | 3 μs | Synchronous Cells |
|  | | 3 | 3 μs | Synchronous Cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
|  | | 2 | SSB.1 FR1 |  |
|  | | 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC pattern 2 | Configured in SIB2 of Cell 1 |
|  | |  | SMTC pattern 6 | Configured in SIB2 of Cell 2 |
|  | | 2 | SMTC pattern 1 |  |
|  | | 3 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all Cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 20 | T1 needs to be defined so that Cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 20 | T2 needs to be defined so that Cell re-selection reaction time is taken into account. |

6.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. 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* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *cellEdgeEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T2 in Table 6.1.1.4.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.1.4.5-1. T1 starts.

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

5. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. 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 13.

7. 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 T1 to T2 as specified in Table 6.1.1.4.5-1. T2 starts.

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

10. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

11. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1. skip to 14

13. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select 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.

6.1.1.4.4.3 Message contents

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

Table 6.1.1.4.4.3-1: Common Exception messages

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

Table 6.1.1.4.4.3-2: 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 6.1.1.4.4.3-3: SIB2 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 |  | 6.1.1.4-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.4-2, 6.1.1.4-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.4-1 |
|  | true |  | 6.1.1.4-2, 6.1.1.4-3 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchThresholdP-r16 | 25 | Actual value is 25\*2 = 50dB |  |
| s-SearchThresholdQ-r16 | Not present |  |  |
| } |  |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.1.4.4.3-4: SIB2 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.1-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 |  | 6.1.1.4-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.4-2, 6.1.1.4-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.4-1 |
|  | true |  | 6.1.1.4-2, 6.1.1.4-3 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchThresholdP-r16 | 25 | Actual value is 25\*2 = 50dB |  |
| s-SearchThresholdQ-r16 | Not present |  |  |
| } |  |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

6.1.1.4.5 Test requirement

Tables 6.1.1.4.4.1-3 and 6.1.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

Table 6.1.1.4.5-1: Cell specific test parameters for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  |  | 2 | SR.1.1 TDD | |  | |
|  |  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
|  |  | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
|  |  | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
|  |  | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
|  |  | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| Qhysts | dB | 1, 2, 3 | 0 | | 0 | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
|  | dB | 1 | -3.56 | 3.22 | 3.22 | -3.56 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| Note2 | dBm/SCS | 1 | -98 | | | |
|  |  | 2 | -98 | | | |
|  |  | 3 | -95 | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | |
|  |  | 2 |  | | | |
|  |  | 3 |  | | | |
|  | dB | 1 | 12.55 | 16 | 16 | 12.55 |
|  |  | 2 |
|  |  | 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85.45 | -82 | -82 | -85.45 |
|  |  | 2 | -85.45 | -82 | -82 | -85.45 |
|  |  | 3 | -82.45 | -79 | -79 | -82.45 |
| Io | dBm/9.36 MHz | 1 | -52.35 | -52.35 | -52.35 | -52.35 |
|  | dBm/9.36 MHz | 2 | -52.35 | -52.35 | -52.35 | -52.35 |
|  | dBm/38.16 MHz | 3 | -46.25 | -46.25 | -46.25 | -46.25 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | 60 | |
| SsearchThresholdP | dB | 1, 2, 3 | 50 | | 50 | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: OCNG shall be used such that both Cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other Cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The cell re-selection delay to detected cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 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 detected cell for UE fulfilling not-at-cell edge criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

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

Tevaluate,NR\_Intra = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.3-1.

TSI-NR = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

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

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

#### 6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

6.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.10.2.

6.1.1.5.2 Test applicability

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

6.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

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

6.1.1.5.4 Test description

6.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.5.4.1-1.

Table 6.1.1.5.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.1.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.5-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.5.4.1-2.

Table 6.1.1.5.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.5.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.5.4.1-3.

2. Message contents are defined in clause 6.1.1.5.4.3.

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

Table 6.1.1.5.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

| Parameter | | Unit | Test configuration | Value | Comment |
| --- | --- | --- | --- | --- | --- |
| Initial condition | Active cell |  | 1, 2, 3 | Cell2 | The UE camps on cell 2 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 1 |
| Neighbour cells |  | 1, 2, 3 | Cell1 |
| T1 end condition | Active cell |  | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| Neighbour cells |  | 1, 2, 3 | Cell2 |
| T2 end condition | Active cell |  | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T2 |
| Neighbour cells |  | 1, 2, 3 | Cell1 |
| RF Channel Number | |  | 1, 2, 3 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
|  | |  | 2 | 3 μs | Synchronous cells |
|  | |  | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | |  | 1 | SSB.1 FR1 |  |
|  | |  | 2 | SSB.1 FR1 |  |
|  | |  | 3 | SSB.2 FR1 |  |
| SMTCconfiguration | |  | 1 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
|  | |  |  | SMTC pattern 6 | Configured in SIB4 of Cell 2 |
|  | |  | 2 | SMTC pattern 1 |  |
|  | |  | 3 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 25 s | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 25 s | T2 is defined so that cell re-selection reaction time is taken into account. |

6.1.1.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

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

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:

*lowMobilityEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.5.5-1.

*cellEdgeEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

2. Set the parameters according to T2 in Table 6.1.1.5.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.1.5.5-1. T1 starts.

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

5. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

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

8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.5.5-1. T2 starts.

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

10. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

11. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 12. 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 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 2. skip to 14

13. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select 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.

6.1.1.5.4.3 Message contents

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

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.1.1.5.4.3-1: 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 6.1.1.5.4.3-2: 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 6.1.1.5.4.3-3: 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 | Cell 2 |
| } |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { |  |  |  |
| lowMobilityEvaluation-r16 SEQUENCE { |  |  |  |
| s-SearchDeltaP-r16 | dB15 |  | Cell 2 |
| t-SearchDeltaP-r16 | s5 |  |  |
| } |  |  |  |
| cellEdgeEvaluation-r16 | Not present |  |  |
| combineRelaxedMeasCondition-r16 | Not present |  |  |
| highPriorityMeasRelax-r16 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.1.5.4.3-4: 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 |  | 6.1.1.5-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.5-2, 6.1.1.5-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.5-1 |
|  | true |  | 6.1.1.5-2, 6.1.1.5-3 |
| threshX-HighP | 24 | Actual value = 24\*2 = 48dB |  |
| threshX-LowP | 24 | Actual value = 24\*2 = 48dB |  |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.1.5.4.3-5: 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 |  | Cell 2 |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 |  | 6.1.1.5-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.5-2, 6.1.1.5-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.5-1 |
|  | true |  | 6.1.1.5-2, 6.1.1.5-3 |
| threshX-HighP | 22 | Actual value = 22\*2 = 44dB | Cell 2 |
| threshX-LowP | 25 | Actual value = 25\*2 = 50dB | Cell 2 |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. | Cell 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.1.1.5.5 Test requirement

Tables 6.1.1.5.4.1-3 and 6.1.1.5.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

Table 6.1.1.5.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | T1 | T2 | T1 | | T2 |
| TDD configuration |  | 1 | N/A | | N/A | | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | SR.1.1 FDD | | |
| configuration |  | 2 | SR.1.1 TDD | | SR.1.1 TDD | | |
|  |  | 3 | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | CR.1.1 FDD | | |
| RMC configuration |  | 2 | CR.1.1 TDD | | CR.1.1 TDD | | |
|  |  | 3 | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | | |
| RMC configuration |  | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | | |
|  |  | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | | |
|  |  | 3 | -137 | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | | |
| Qhysts | dB | 1, 2, 3 | 0 | | 0 | | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | SS-RSRP | | |
|  | dB | 1 | 14 | 14 | -3.70 | 9.75 | |
|  |  | 2 |  |  |  |  | |
|  |  | 3 |  |  |  |  | |
| Note2 | dBm/SCS | 1 | -98 | | | | |
|  |  | 2 | -98 | | | | |
|  |  | 3 | -95 | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | |
|  |  | 2 |  | | | | |
|  |  | 3 |  | | | | |
|  | dB | 1 | 14 | 14 | -3.70 | | 9.75 |
|  |  | 2 |  |  |  | |  |
|  |  | 3 |  |  |  | |  |
| SS-RSRP Note3 | dBm/SCS | 1 | -84 | -84 | -101.70 | | -88.25 |
|  |  | 2 | -84 | -84 | -101.70 | | -88.25 |
|  |  | 3 | -81 | -81 | -98.70 | | -85.25 |
| Io | dBm/9.36 MHz | 1 | -55.88 | -55.88 | -68.50 | | -59.86 |
|  | dBm/9.36 MHz | 2 | -55.88 | -55.88 | -68.50 | | -59.86 |
|  | dBm/38.16 MHz | 3 | -49.79 | -49.79 | -62.40 | | -53.76 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | Not sent | | Not sent | | |
| Threshx, highP | dB | 1, 2, 3 | 48 | | 44 | | |
| Threshserving, lowP | dB | 1, 2, 3 | 44 | | 46 | | |
| Threshx, lowP | dB | 1, 2, 3 | 48 | | 50 | | |
| SSearchDeltaP | dB | 1, 2, 3 | 3 | | 15 | | |
| TSearchDeltaP | s | 1, 2, 3 | 5 | | 5 | | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The cell re-selection delay to detected lower priority cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 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 detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

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

Tevaluate,NR\_Inter = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

TSI-NR = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling low mobility criterion in the test case.

The cell re-selection delay to detected higher priority cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 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 detected higher priority cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = Tevaluate,NR\_Inter + TSI-NR

Tevaluate,NR\_Inter = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

TSI-NR = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher priority cell for UE fulfilling low mobility criterion in the test case.

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

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

#### 6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.10.3.

6.1.1.6.2 Test applicability

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

6.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.6.

6.1.1.6.4 Test description

6.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.6.4.1-1.

Table 6.1.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.1.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.6-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.6.4.1-2.

Table 6.1.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.6.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.6.4.1-3.

2. Message contents are defined in clause 6.1.1.6.4.3.

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

Table 6.1.1.6.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell2 | The UE camps on cell 2 in the initial phase, it fulfils Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to cell 1 |
| Neighbour cells |  | 1, 2, 3 | Cell1 |
| T1 end condition | Active cell |  | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| Neighbour cells |  | 1, 2, 3 | Cell2 |
| T2 end condition | Active cell |  | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T2 |
| Neighbour cells |  | 1, 2, 3 | Cell1 |
| RF Channel Number | |  | 1, 2, 3 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
|  | |  | 2 | 3 μs | Synchronous cells |
|  | |  | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | |  | 1 | SSB.1 FR1 |  |
|  | |  | 2 | SSB.1 FR1 |  |
|  | |  | 3 | SSB.2 FR1 |  |
| SMTCconfiguration | |  | 1 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
|  | |  |  | SMTC pattern 6 | Configured in SIB4 of Cell 2 |
|  | |  | 2 | SMTC pattern 1 |  |
|  | |  | 3 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 20 s | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 20 s | T2 is defined so that cell re-selection reaction time is taken into account. |

6.1.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

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

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:

* *cellEdgeEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.6.5-1.
* *lowMobilityEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

2. Set the parameters according to T2 in Table 6.1.1.6.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.1.6.5-1. T1 starts.

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

5. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

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

8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.6.5-1. T2 starts.

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

10. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

11. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 12. 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 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 2. skip to 14

13. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select 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.

6.1.1.6.4.3 Message contents

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

Table 6.1.1.6.4.3-1: 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 6.1.1.6.4.3-2: 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 6.1.1.6.4.3-3: 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 6.1.1.6.4.3-4: 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 |  | 6.1.1.6-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.6-2, 6.1.1.6-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.6-1 |
|  | true |  | 6.1.1.6-2, 6.1.1.6-3 |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.1.6.4.3-5: 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 |  | 6.1.1.6-1 |
|  | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.1.6-2, 6.1.1.6-3 |
| deriveSSB-IndexFromCell | false |  | 6.1.1.6-1 |
|  | true |  | 6.1.1.6-2, 6.1.1.6-3 |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. | Cell 2 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.1.1.6.5 Test requirement

Tables 6.1.1.6.4.1-3 and 6.1.1.6.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

Table 6.1.1.6.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | T1 | T2 | | T1 | | T2 |
| TDD configuration |  | 1 | N/A | | | N/A | | |
|  |  | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
|  |  | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| configuration |  | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
|  |  | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| RMC configuration |  | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
|  |  | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| RMC configuration |  | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
|  |  | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
|  |  | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2, 3 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 16 | 14 | | -3.65 | 16 | |
|  |  | 2 |  |  | |  |  | |
|  |  | 3 |  |  | |  |  | |
| Note2 | dBm/SCS | 1 | -98 | | -100 | | | |
|  |  | 2 | -98 | | -100 | | | |
|  |  | 3 | -95 | | -97 | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | -100 | | | |
|  |  | 2 |  | | | | | |
|  |  | 3 |  | | | | | |
|  | dB | 1 | 16 | 14 | | -3.65 | | 16 |
|  |  | 2 |  |  | |  | |  |
|  |  | 3 |  |  | |  | |  |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -84 | | -103.65 | | -84 |
|  |  | 2 | -82 | -84 | | -103.65 | | -84 |
|  |  | 3 | -79 | -81 | | -100.65 | | -81 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -55.88 | | -70.49 | | -55.94 |
|  | dBm/9.36 MHz | 2 | -53.94 | -55.88 | | -70.49 | | -55.94 |
|  | dBm/38.16 MHz | 3 | -47.84 | -49.79 | | -63.39 | | -49.84 |
| Treselection | s | 1, 2, 3 | 0 | 0 | | 0 | | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | Not sent | | | Not sent | | |
| Threshx, highP | dB | 1, 2, 3 | 48 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3 | 44 | | | 44 | | |
| Threshx, lowP | dB | 1, 2, 3 | 50 | | | 50 | | |
| SSearchThresholdP | dB | 1, 2, 3 | 50 | | | 50 | | |
| SSearchThresholdQ | dB | 1, 2, 3 | Not Configured | | | | | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

The cell re-selection delay to detected lower priority cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 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 detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

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

Tevaluate,NR\_Inter = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

TSI-NR = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge criterion in the test case.

The cell re-selection delay to detected higher priority cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 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 detected higher priority cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = Tevaluate,NR\_Inter + TSI-NR

Tevaluate,NR\_Inter = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

TSI-NR = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher priority cell for UE fulfilling not-at-cell edge criterion in the test case.

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

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

#### 6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

6.1.1.7.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE configured with *highSpeedMeasFlag-r16* is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

6.1.1.7.2 Test applicability

This test applies to all types of NR UE from release 15 onwards that supports measurement enhancements in high speed scenario

6.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.7.

6.1.1.7.4 Test description

6.1.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.7.4.1-1.

Table 6.1.1.7.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 6.1.1.7-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.1.1.7-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.1.1.7-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.7.4.1-2.

Table 6.1.1.7.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.7.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.7.4.1-3.

2. Message contents are defined in clause 6.1.1.7.4.3.

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

Table 6.1.1.7.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial | Active cell |  | 1, 2, 3 | Cell1 |  |
| condition | Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| T2 end condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| Neighbour cells |  | 1, 2, 3 | Cell1 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
|  | |  | 2 | 3 μs | Synchronous cells |
|  | |  | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
|  | |  | 2 | SSB.1 FR1 |  |
|  | |  | 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
|  | |  | 2 | SMTC.1 |  |
|  | |  | 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | >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, 3 | 10 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3 | 9 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.1.7.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. *highSpeedMeasFlag-r16* is broadcasted to UE.

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* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 6.1.1.7.5-1. T1 starts.

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

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.7.5-1. 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 4 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

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

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

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.7.5-1. 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 from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

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

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

12. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.  
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

6.1.1.7.4.3 Message contents

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

Table 6.1.1.7.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks on condition of HighSpeedMeas with exceptions | Table H.2.1-1 with Condition SMTC.2 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 1  Table H.2.1-1 with Condition SMTC.6 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 2  Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-2  Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-3  Table H.2.1-2  Table H.2.1-3 with Condition HighSpeedMeas |
| Default RRC messages and information elements contents exceptions |  |

6.1.1.7.5 Test requirement

Tables 6.1.1.7.4.1-3 and 6.1.1.7.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16.

Table 6.1.1.7.5-1: Cell specific test parameters for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | T1 | T2 | T3 | T1 | | T2 | T3 |
| TDD configuration |  | 1 | N/A | | | N/A | | | |
|  |  | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | | |
|  |  | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | | |
| configuration |  | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | | |
|  |  | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | | |
| RMC configuration |  | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | | |
|  |  | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | | |
| Dedicated CORESET |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | | |
| RMC configuration |  | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | | |
|  |  | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.2.1-1 | | | OP.1 defined in A.2.1-1 | | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | | |
|  |  | 3 | -137 | | | -137 | | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | | |
| Qhysts | dB | 1, 2, 3 | 0 | | | 0 | | | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | | 0 | | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | | |
|  | dB | 1 | 16 | -3.55 | 3.24 | -infinity | | 3.24 | -3.55 |
|  | 2 |  |  |  |  | |  |  |
|  | 3 |  |  |  |  | |  |  |
| Note2 | dBm/SCS | 1 | -98 | | | | | | |
|  | 2 | -98 | | | | | | |
|  | 3 | -95 | | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | | |
|  | 2 |  | | | | | | |
|  | 3 |  | | | | | | |
|  | dB | 1 | 16 | 13 | 16.45 | -infinity | | 16.45 | 13 |
|  | 2 |  |  |  |  | |  |  |
|  | 3 |  |  |  |  | |  |  |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -85 | 81.55 | -infinity | | -81.55 | -85 |
|  |  | 2 | -82 | -85 | -81.55 | -infinity | | -81.55 | -85 |
|  |  | 3 | -79 | -82 | -78.54 | -infinity | | -78.54 | -82 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -51.91 | -51.91 | specified in Cell 1 columns- | | | |
|  | dBm/9.36 MHz | 2 | -53.94 | -51.91 | -51.91 |  | | | |
|  | dBm/38.16 MHz | 3 | -47.85 | -45.81 | -45.81 |  | | | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | | 60 | | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | AWGN 1944Hz Note4 | | |
| Propagation Condition |  | 3 | AWGN | | | | AWGN 3334Hz Note5 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.  Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz. | | | | | | | | | |

The 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 Tracking Area Update procedure on Cell 2.

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

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

Tdetect,NR\_Intra = 2.56 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

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

The cell re-selection delay to a newly detectable cell shall be less than a total of 3.84 seconds in this test case (note: this gives a total of 3.84 seconds but the test allows 4 seconds).

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 Tracking Area Update procedure on cell 1.

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

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

Tevaluate,NR\_Intra = 0.96 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

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

The cell re-selection delay to an already detected cell shall be less than a total of 2.24 seconds in this test case (note: this gives a total of 2.24 seconds but the test allows 3 seconds).

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

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

#### 6.1.1.8 NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

6.1.1.8.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements for UE configured with *highSpeedMeasInterFreq-r17* specified in TS 38.133 [6] in clause 4.2.2.4.

6.1.1.8.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting the high-speed inter-frequency IDLE/INACTIVE measurements.

6.1.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause TBD

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.8

6.1.1.8.4 Test description

6.1.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.1.1.8.4.1-1.

Table 6.1.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.1.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.8-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.8.4.1-2.

Table 6.1.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | - Without LTE link  - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |  |

1. The general test parameter settings are set up according to Table 6.1.1.8.4.1-3.

2. Message contents are defined in clause 6.1.1.8.4.3.

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

Table 6.1.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
|  | Neighbour cell |  | 1, 2, 3 | Cell 1 |  |
| T1 end condition | Active cell |  | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
|  | Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| T3 end condition | Active cell |  | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 during T3 |
|  | Neighbour cell |  | 1, 2, 3 | Cell 1 |  |
| RF Channel Number | |  | 1, 2, 3 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
|  | |  | 2 | 3 μs | Synchronous cells |
|  | |  | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
|  | |  | 2 | SSB.1 FR1 |  |
|  | |  | 3 | SSB.2 FR1 |  |
| SMTCconfiguration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 10 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2, 3 | 12 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.1.8.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. 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.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 6.1.1.8.5-1. T1 starts.

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

4. If the UE responds on Cell 1 during time duration T1 within 3 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6.  
Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

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

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.8.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.8.5-1. T3 starts.

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

10. If the UE responds on Cell 2 during time duration T3 within 5 seconds from the beginning of time period T3, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 12.  
Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

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

13. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

14. Repeat step 2-13 until a test verdict has been achieved.  
Each of the events “Re-select Cell 1” and “Re-select 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.

6.1.1.8.4.3 Message contents

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

Table 6.1.1.8.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.2-1  Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 1  Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 2  Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-2  Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-3  Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions |  |

Table 6.1.1.8.4.3-2: *SIB4*: NR inter frequency cell re-selection with highSpeedMeasInterFreq-r17

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.2-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB4 ::= SEQUENCE { |  |  |  |
| InterFreqCarrierFreqInfo-v1700 ::= SEQUENCE { |  |  |  |
| highSpeedMeasInterFreq-r17 | TRUE |  |  |
| } |  |  |  |
| } |  |  |  |

6.1.1.8.5 Test requirement

Table 6.1.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 6.1.1.8.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1 | N/A | | | N/A | | |
|  |  | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
|  |  | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| configuration |  | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
|  |  | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| RMC configuration |  | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
|  |  | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| RMC configuration |  | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
|  |  | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
|  |  | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
|  |  | 2 |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  |  |  |
| Note2 | dBm/SCS | 1 | -98 | | | -100 | -98 | -98 |
| 2 | -98 | | | -100 | -98 | -98 |
| 3 | -95 | | | -97 | -95 | -95 |
| Note2 | dBm/15 kHz | 1 | -98 | | |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
|  |  |  |  | | | | | |
|  | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
|  |  | 2 |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  |  |  |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
|  |  | 2 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
|  |  | 3 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 |
| Io | dBm/9.36 MHz | 1 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
|  | dBm/9.36 MHz | 2 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
|  | dBm/38.16 MHz | 3 | -48.23 | -48.23 | -48.23 | -67.37 | -infinity | -53.17 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | |
| Threshx, highP | dB | 1, 2, 3 | 48 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3 | 44 | | | 44 | | |
| Threshx, lowP | dB | 1, 2, 3 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN for active cell, AWGN 1944HzNote 4 for neighbour cell | | | | | |
| Propagation Condition |  | 3 | AWGN for active cell, AWGN 3334HzNote 5 for neighbour cell | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.  Note 5: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334 Hz. | | | | | | | | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T3, 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 a newly detectable cell shall be less than 5 s.

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

The cell re-selection delay to an already detected cell shall be less than 3 s.

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

### 6.1.2 NR – E-UTRA cell re-selection

#### 6.1.2.0 Minimum conformance requirements

##### 6.1.2.0.1 Minimum conformance requirements for NR – E-UTRA cell re-selection

The cell re-selection delay to a higher priority cell shall be less than Thigher\_priority\_search + Tevaluate, EUTRAN + TSI-E-UTRA in RRC\_IDLE state.

The cell re-selection delay to a lower priority E-UTRA cell shall be less than Tevaluate, E-UTRAN + TSI-E-UTRA in RRC\_IDLE state.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2 of TS 38.133 [6].

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

The requirements in this section apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this section. The parameter NEUTRA\_carrier is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA 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,EUTRAN/2.

The parameter NEUTRA\_carrier is the total number of configured E-UTRA carriers indicated to meet non high speed requirements in the neighbour frequency list. The parameter NEUTRA\_carrier\_HST is the total number of configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list. If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, an inter-RAT E-UTRAN layer is indicated to meet high speed requirements if highSpeedMeasFlag-r16 is configured and the carrier to be measured is configured with highSpeedEUTRACarrier-r16 and UE supports the enhanced inter-RAT E-UTRAN measurement requirements. If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, UE is required to meet non high speed requirements no matter whether highSpeedMeasFlag-r16 or highSpeedEUTRACarrier-r16 is configured or not.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band, and

- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.

- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [1] within NEUTRA\_carrier\_HST \* Tdetect,EUTRAN\_HST + NEUTRA\_carrier \* Tdetect,EUTRAN when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every (NEUTRA\_carrier) \* Tmeasure,EUTRAN when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,EUTRAN. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN 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 not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a 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 an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [30] within (NEUTRA\_carrier) \* Tevaluate,EUTRAN when Treselection = 0as specified in table 4.2.2.5-1 of TS 38.133 [6] provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If Treselection timer has a non-zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this E-UTRA cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.5.

Table 6.1.2.0.1-1: Tdetect,EUTRAN, Tmeasure,EUTRAN, and Tevaluate,EUTRAN

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN [s] (number of DRX cycles) | Tmeasure,EUTRAN [s] (number of DRX cycles) | Tevaluate,EUTRAN  [s] (number of DRX cycles) |
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Table 6.1.2.0.1-2: Tdetect,EUTRAN\_HST, Tmeasure,EUTRAN\_HST, and Tevaluate,EUTRAN\_HST for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EURAN\_HST [s] (number of DRX cycles) | Tmeasure,EUTRAN\_HST [s] (number of DRX cycles) | Tevaluate,EUTRAN\_HST  [s] (number of DRX cycles) |
|  |
| 0.32 | 4.16 (13) | 0.64 (2) | 0.96 (3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 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 highSpeedMeasFlag-r16 is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[interRAT-MeasurementEnhancement-r16]*. | | | |

The requirements in Table 6.1.2.0.1-2 apply only when the UE supports *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 6.1.2.0.1-2.

##### 6.1.2.0.2 Minimum conformance requirement for inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion

6.1.2.0.2.1 Introduction

This clause contains the requirements for measurements on inter-RAT E-UTRAN cells when the UE is configured with any of following relaxed measurement critera:

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

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

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

6.1.2.0.2.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

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

- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and

- UE has fulfilled only the *lowMobilityEvalutation* [13] criterion.

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- Tdetect,EUTRANas specified in Table 6.1.2.0.2.2-1.

- Tmeasure,EUTRAN as specified in Table 6.1.2.0.2.2-1.

- Tevaluate,EUTRAN as specified in Table 6.1.2.0.2.2-1.

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

Table 6.1.2.0.2.2-1: Tdetect,EUTRAN, Tmeasure,EUTRAN, and Tevaluate,EUTRAN

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN [s] (number of DRX cycles) | Tmeasure,EUTRAN [s] (number of DRX cycles) | Tevaluate,EUTRAN  [s] (number of DRX cycles) |
| 0.32 | 11.52 x K1 (36 x K1) | 1.28 x K1 (4 x K1) | 5.12 x K1 (16 x K1) |
| 0.64 | 17.92 x K1 (28 x K1) | 1.28 x K1 (2 x K1) | 5.12 x K1 (8 x K1) |
| 1.28 | 32 x K1 (25 x K1) | 1.28 x K1 (1 x K1) | 6.4 x K1 (5 x K1) |
| 2.56 | 58.88 x K1 (23 x K1) | 2.56 x K1 (1 x K1) | 7.68 x K1 (3 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion. | | | |

6.1.2.0.2.3 Measurements for UE fulfilling with not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

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

- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and

- UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- Tdetect,EUTRANas specified in Table 6.1.2.0.2.3-1.

- Tmeasure,EUTRAN as specified in Table 6.1.2.0.2.3-1.

- Tevaluate,EUTRAN as specified in Table 6.1.2.0.2.3-1.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-RAT E-UTRAN frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 of TS 38.133 [6].

Table 6.1.2.0.2.3-1: Tdetect,EUTRAN, Tmeasure,EUTRAN, and Tevaluate,EUTRAN

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN [s] (number of DRX cycles) | Tmeasure,EUTRAN [s] (number of DRX cycles) | Tevaluate,EUTRAN  [s] (number of DRX cycles) |
| 0.32 | 11.52 x K1 (36 x K1) | 1.28 x K1 (4 x K1) | 5.12 x K1 (16 x K1) |
| 0.64 | 17.92 x K1 (28 x K1) | 1.28 x K1 (2 x K1) | 5.12 x K1 (8 x K1) |
| 1.28 | 32 x K1 (25 x K1) | 1.28 x K1 (1 x K1) | 6.4 x K1 (5 x K1) |
| 2.56 | 58.88 x K1 (23 x K1) | 2.56 x K1 (1 x K1) | 7.68 x K1 (3 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion. | | | |

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

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

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

- has also fulfilled both criteria, and

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

In this case the UE is not required to meet Tdetect,EUTRAN, Tmeasure,EUTRAN and Tevaluate,EUTRAN as defined in Table 6.1.2.0.1-1.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.11.

#### 6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA

6.1.2.1.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of higher priority.

6.1.2.1.2 Test applicability

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

6.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.1.

6.1.2.1.4 Test description

6.1.2.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.1.4.1-1.

Table 6.1.2.1.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.2.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.1-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.1-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.1-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.1-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.1.4.1-2.

Table 6.1.2.1.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to higher priority E-UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.1.2.1.4.1-3.

2. Message contents are defined in clause 6.1.2.1.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.1.4.1-3: General test parameters for NR to higher priority E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2. |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T2. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T3 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T3 for iteration of the tests. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 |
| 4, 5, 6 | 4 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | >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, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3, 4, 5, 6 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T1 starts.

3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T2 starts.

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

6. If the UE responds on Cell 2 during time duration T2 within 68 seconds 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. 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 11.

7a The SS shall send an *RRCConnectionRelease* 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 6.1.2.1.5-1 and 6.1.2.1.5-2. T3 starts.

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

10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 10a.  
Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

11. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-11 until a test verdict has been achieved.

6.1.2.1.4.3 Message contents

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

Table 6.1.2.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.3-1  Table H.2.3-2 with Condition SMTC 1 and higher priority for configuration 6.1.2.1-2, 6.1.2.1-3, 6.1.2.1-5 and 6.1.2.1-6  Table H.2.3-2 with Condition SMTC 2 and higher priority for configuration 6.1.2.1-1 and 6.1.2.1-4  Table H.2.3-3 with Condition higher priority |
| Default RRC messages and information elements contents exceptions |  |

Table 6.1.2.1.4.3-2: SystemInformationBlockType3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | | |
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { | |  |  |  |
| threshServingLow | | 22 | Actual value = 44 dB |  |
| cellReselectionPriority | | 5 |  | higher priority E-UTRA |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.2.1.4.3-3: SystemInformationBlockType24

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { |  |  |  |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry |  |  |
| cellReselectionPriority-r15[*n*] | 4 |  | higher priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB |  |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB |  |
| } |  |  |  |
| } |  |  |  |

6.1.2.1.5 Test requirement

Tables 6.1.2.1.4.1-3, 6.1.2.1.5-1 and 6.1.2.1.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

Table 6.1.2.1.5-1: Cell specific test parameters for NR cell 1

| Parameter | Unit | Test configuration | Cell 1 | | |
| --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| TDD configuration |  | 1, 4 | N/A | | |
|  | 2, 5 | TDDConf.1.1 | | |
|  | 3, 6 | TDDConf.2.1 | | |
| PDSCH parameters |  | 1, 4 | SR.1.1 FDD | | |
|  | 2, 5 | SR.1.1 TDD | | |
|  | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET parameters |  | 1, 4 | CR.1.1 FDD | | |
|  | 2, 5 | CR.1.1 TDD | | |
|  | 3, 6 | CR.2.1 TDD | | |
| Dedicated CORESET parameters |  | 1, 4 | CCR.1.1 FDD | | |
|  | 2, 5 | CCR.1.1 TDD | | |
|  | 3, 6 | CCR.2.1 TDD | | |
| SSB parameters |  | 1, 4 | SSB.1 FR1 | | |
|  | 2, 5 | SSB.1 FR1 | | |
|  | 3, 6 | SSB.2 FR1 | | |
| NR SMTC parameters |  | 1, 4 | SMTC 2 | | |
|  | 2, 5 | SMTC 1 | | |
|  | 3, 6 | SMTC 1 | | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
| 3, 6 | -137 | | |
|  | dBm/SCS | 1, 4 | -98 | | |
| 2, 5 | -98 | | |
| 3, 6 | -95 | | |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| SS-RSRP | dBm/SCS | 1, 4 | -84 | -82.4 | -82.4 |
| 2, 5 | -84 | -82.4 | -82.4 |
| 3, 6 | -81 | -79.39 | -79.39 |
|  | dB | 1, 4 | 14 | 15.6 | 15.6 |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | 14 | 15.6 | 15.6 |
| 2, 5 |
| 3, 6 |
| Io | dBm/9.36 MHz | 1, 4 | -55.88 | -54.33 | -54.33 |
| dBm/9.36 MHz | 2, 5 | -55.88 | -54.33 | -54.33 |
| dBm/38.16 MHz | 3, 6 | -49.79 | -48.23 | -48.23 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Threshx, highP (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | | |
| Threshx, lowP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of threshX-Highwhich is included in NR system information, and is a threshold for the E-UTRA target cell. | | | | | |

Table 6.1.2.1.5-2: Cell specific test parameters for E-UTRA cell 2

| Parameter | Unit | Cell 2 | | | |
| --- | --- | --- | --- | --- | --- |
| T1 | T2 | | T3 |
| E-UTRA RF Channel number |  | 1 | | | |
| BWchannel | MHz | 10 | | | |
| OCNG Patterns defined in TS 36.133 clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | | | |
| PBCH\_RA | dB | 0 | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | | |
|  | dBm/15 kHz | -98 | | -98 | -100 |
| RSRP | dBm/15 KHz | -infinity | | -84.4 | -103.6 |
|  | dB | -infinity | | 13.6 | -3.6 |
|  | dB | -infinity | | 13.6 | -3.6 |
| TreselectionEUTRAN | S | 0 | | | |
| SnonintrasearchP | dB | Not sent | | | |
| Threshx, highP | dB | 48 | | | |
| Threshserving, lowP | dB | 44 | | | |
| Threshx, lowP (Note 2) | dB | 50 | | | |
| 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: This refers to the value of threshX-Low-r15which is included in E-UTRA system information, and is a threshold for the NR target cell. | | | | | |

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 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, E-UTRAN + TSI-E-UTRA,

Where:

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

Tevaluate, E-UTRAN See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

TSI-E-UTRA 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 E-UTRAN cell.

#### 6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA

6.1.2.2.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of lower priority.

6.1.2.2.2 Test applicability

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

6.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.2.

6.1.2.2.4 Test description

6.1.2.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.2.4.1-1.

Table 6.1.2.2.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.2.2-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.2-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.2-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.2-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.2-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.2-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equirement and the DUT according to the parameters in Table 6.1.2.2.4.1-2.

Table 6.1.2.2.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.1.2.2.4.1-3.

2. Message contents are defined in clause 6.1.2.2.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.2.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |  |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 |
| 4, 5, 6 | 4 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.2.2.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

1a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec(Tdetect,EUTRAN) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

2. Set the parameters according to T1 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T1 starts.

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

4. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 5a.  
Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 9.

5a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 2.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T2 starts.

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

8. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 8a.  
Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch on and off the UE and skip to step 9.

8a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1.

9. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

9a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec(Tdetect,EUTRAN) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

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

6.1.2.2.4.3 Message contents

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

Table 6.1.2.2.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.3-1  Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions |  |

Table 6.1.2.2.4.3-1A: SIB2

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.3-2 with condition lower priority | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { |  |  |  |
| s-NonIntraSearchP | Not present | UE applies the default value of infinity |  |
| } |  |  |  |
| intraFreqCellReselectionInfo SEQUENCE { |  |  |  |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 |  | 6.1.2.2-2,  6.1.2.2-3,  6.1.2.2-5,  6.1.2.2-6 |
|  | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 |  | 6.1.2.2-1,  6.1.2.2-4, |
| } |  |  |  |
| } |  |  |  |

Table 6.1.2.2.4.3-2: SystemInformationBlockType3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | | |
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { | |  |  |  |
| threshServingLow | | 22 | Actual value = 44 dB |  |
| cellReselectionPriority | | 4 |  | lower priority E-UTRA |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.2.2.4.3-3: SystemInformationBlockType24

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { |  |  |  |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry |  |  |
| cellReselectionPriority-r15[*n*] | 5 |  | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB |  |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB |  |
| } |  |  |  |
| } |  |  |  |

6.1.2.2.5 Test requirement

Tables 6.1.2.2.4.1-3, 6.1.2.2.5-1 and 6.1.2.2.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.2.5-1: Cell specific test parameters for NR cell 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
| T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | |
|  | 2, 5 | TDDConf.1.1 | |
|  | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | |
|  | 2, 5 | SR.1.1 TDD | |
|  | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | |
|  | 2, 5 | CR.1.1 TDD | |
|  | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | |
|  | 2, 5 | CCR.1.1 TDD | |
|  | 3, 6 | CCR.2.1 TDD | |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | |
|  | 2, 5 | SSB.1 FR1 | |
|  | 3, 6 | SSB.2 FR1 | |
| SMTC configuration |  | 1, 4 | SMTC pattern 2 | |
|  | 2, 5 | SMTC pattern 1 | |
|  | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.2.1-1 | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| 3, 6 | -137 | |
|  | dBm/SCS | 1, 4 | -100 | -98 |
| 2, 5 | -100 | -98 |
| 3, 6 | -97 | -95 |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.6 | -84.4 |
| 2, 5 | -103.6 | -84.4 |
| 3, 6 | -100.59 | -81.39 |
|  | dB | 1, 4 | -3.6 | 13.6 |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | -3.6 | 13.6 |
| 2, 5 |
| 3, 6 |
| Io | dBm/9.36 MHz | 1, 4 | -70.46 | -56.26 |
| dBm/9.36 MHz | 2, 5 | -70.46 | -56.26 |
| dBm/38.16 MHz | 3, 6 | -64.38 | -50.16 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | Not sent | |
| Threshx, highP | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| Threshx, low P (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, LowP** which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | |

Table 6.1.2.2.5-2: Cell specific test parameters for E-UTRA cell 2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | |
| T1 | T2  T3 |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | |
|  | dBm/15 kHz | -98 | |
| RSRP | dBm/15 KHz | -82.4 | -84 |
|  | dB | 15.6 | 14 |
|  | dB | 15.6 | 14 |
| TreselectionEUTRAN | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| Threshx, highP (Note 2) | dB | 48 | |
| Threshserving, lowP | dB | 44 | |
| Threshx, lowP | dB | 50 | |
| 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: This refers to the value of Thresh**x, highP** which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

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 lower priority cell can be expressed as: Tevaluate, E-UTRAN + TSI-E-UTRA,

Where:

Tevaluate, E-UTRAN See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

TSI-E-UTRA 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 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

#### 6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion

6.1.2.3.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the low mobility criterion specified in clause 4.2.2.11.2 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

6.1.2.3.2 Test applicability

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

6.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.3.

6.1.2.3.4 Test description

6.1.2.3.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.3.4.1-1.

Table 6.1.2.3.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.2.3-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.3-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.3-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.3-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.3-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.3-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.3.4.1-2.

Table 6.1.2.3.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA for UE fulfilling low mobility relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.1.2.3.4.1-3.

2. Message contents are defined in clause 6.1.2.3.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.3.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 2. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |  |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 with higher priority during T2 for iteration of the tests. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.64 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 |
| index | |  | 4, 5, 6 | 4 |  |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 24 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 24 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.2.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

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

- *lowMobilityEvalutation* [13] criterion is configured according to the parameters listed in Table 6.1.2.3.5-1;

- *cellEdgeEvaluation* [13] criterion is not configured;

- *combineRelaxedMeasCondition* [13] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T1 starts.

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

4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6.  
Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

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

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T2 starts.

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

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10.  
Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC\_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

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

6.1.2.3.4.3 Message contents

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

Table 6.1.2.3.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.3-1  Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.3-2, 6.1.2.3-3, 6.1.2.3-5 and 6.1.2.3-6  Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.3-1 and 6.1.2.3-4  Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.2-1 |

Table 6.1.2.3.4.3-2: SIB2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.2-1 | | | | |
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | |  |  |  |
| 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 6.1.2.3.4.3-3: SystemInformationBlockType3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | | |
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { | |  |  |  |
| threshServingLow | | 22 | Actual value = 44 dB |  |
| cellReselectionPriority | | 4 |  | lower priority E-UTRA |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.2.3.4.3-4: SystemInformationBlockType24

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { |  |  |  |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry |  |  |
| cellReselectionPriority-r15[*n*] | 5 |  | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB |  |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB |  |
| } |  |  |  |
| } |  |  |  |

6.1.2.3.5 Test requirement

Tables 6.1.2.3.4.1-3, 6.1.2.3.5-1 and 6.1.2.3.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.3.5-1: Cell specific test parameters for NR cell 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
| T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | |
|  | 2, 5 | TDDConf.1.1 | |
|  | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | |
|  | 2, 5 | SR.1.1 TDD | |
|  | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | |
|  | 2, 5 | CR.1.1 TDD | |
|  | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | |
|  | 2, 5 | CCR.1.1 TDD | |
|  | 3, 6 | CCR.2.1 TDD | |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | |
|  | 2, 5 | SSB.1 FR1 | |
|  | 3, 6 | SSB.2 FR1 | |
| SMTC configuration |  | 1, 4 | SMTC pattern 2 | |
|  | 2, 5 | SMTC pattern 1 | |
|  | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| 3, 6 | -137 | |
|  | dBm/SCS | 1, 4 | -100 | -98 |
| 2, 5 | -100 | -98 |
| 3, 6 | -97 | -95 |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.6 | -84.4 |
| 2, 5 | -103.6 | -84.4 |
| 3, 6 | -100.6 | -81.4 |
|  | dB | 1, 4 | -3.6 | 13.6 |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | -3.6 | 13.6 |
| 2, 5 |
| 3, 6 |
| Io | dBm/9.36 MHz | 1, 4 | -70.48 | -56.26 |
| dBm/9.36 MHz | 2, 5 | -70.48 | -56.26 |
| dBm/38.16 MHz | 3, 6 | -64.37 | -50.16 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Threshx, highP | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| Threshx, low P (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| SSearchDeltaP | dB | 1, 2, 3, 4, 5, 6 | 3 | |
| TSearchDeltaP | s | 1, 2, 3, 4, 5, 6 | 5 | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, Low** which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | |

Table 6.1.2.3.5-2: Cell specific test parameters for E-UTRA cell 2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | |
| T1 | T2  T3 |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | |
|  | dBm/15 kHz | -98 | |
| RSRP | dBm/15 KHz | -82.4 | -84 |
|  | dB | 15.6 | 14 |
|  | dB | 15.6 | 14 |
| TreselectionEUTRAN | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| Threshx, highP (Note 2) | dB | 48 | |
| Threshserving, lowP | dB | 44 | |
| Threshx, lowP | dB | 50 | |
| 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: This refers to the value of Thresh**x, high** which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 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, E-UTRAN + TSI-E-UTRA,

Where:

Tevaluate, E-UTRAN See Table 4.2.2.11.2-1 in clause 4.2.2.11.2 of TS 38.133 [6]

TSI-E-UTRA 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 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling low mobility criterion.

#### 6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.2.4.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the not-at-cell edge criterion specified in clause 4.2.2.11.3 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

6.1.2.4.2 Test applicability

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

6.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.4.

6.1.2.4.4 Test description

6.1.2.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.4.4.1-1.

Table 6.1.2.4.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.2.4-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.4-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.4-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.4-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.4-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.4-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.4.4.1-2.

Table 6.1.2.4.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA for UE fulfilling not-at-cell edge relaxed measurement criterion

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.1.2.4.4.1-3.

2. Message contents are defined in clause 6.1.2.4.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.4.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase and fulfil the not at the cell edge |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | criteria. |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.64 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 |
| index | |  | 4, 5, 6 | 4 |  |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 24 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 24 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.2.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

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

- *lowMobilityEvalutation* [2] criterion is not configured;

- *cellEdgeEvaluation* [2] criterion is configured according to the parameters listed in Table 6.1.2.4.5-1;

- *combineRelaxedMeasCondition* [2] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T1 starts.

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

4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6.  
Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

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

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T2 starts.

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

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10.  
Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC\_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

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

6.1.2.4.4.3 Message contents

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

Table 6.1.2.4.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions | Table H.2.3-1  Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.4-2, 6.1.2.4-3, 6.1.2.4-5 and 6.1.2.4-6  Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.4-1 and 6.1.2.4-4  Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.2-1 |

Table 6.1.2.4.4.3-2: SIB2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.2-1 | | | | |
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | |  |  |  |
| relaxedMeasurement-r16 SEQUENCE { | |  |  |  |
| lowMobilityEvaluation-r16 | | Not present |  |  |
| cellEdgeEvaluation-r16 SEQUENCE { | |  |  |  |
| s-SearchTHresholdP-r16 | | 16 | Actual value is 16\*2 = 32dB |  |
| } | |  |  |  |
| combineRelaxedMeasCondition-r16 | | Not present |  |  |
| highPriorityMeasRelax-r16 | | Not present |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.2.4.4.3-3: SystemInformationBlockType3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | | |
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | |  |  |  |
| cellReselectionServingFreqInfo SEQUENCE { | |  |  |  |
| threshServingLow | | 22 | Actual value = 44 dB |  |
| cellReselectionPriority | | 4 |  | lower priority E-UTRA |
| } | |  |  |  |
| } | |  |  |  |

Table 6.1.2.4.4.3-4: SystemInformationBlockType24

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { |  |  |  |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry |  |  |
| cellReselectionPriority-r15[*n*] | 5 |  | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB |  |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB |  |
| } |  |  |  |
| } |  |  |  |

6.1.2.4.5 Test requirement

Tables 6.1.2.4.4.1-3, 6.1.2.4.5-1 and 6.1.2.4.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.4.5-1: Cell specific test parameters for NR cell 1

| Parameter | Unit | Test configuration | Cell 1 | |
| --- | --- | --- | --- | --- |
| T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | |
|  | 2, 5 | TDDConf.1.1 | |
|  | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | |
|  | 2, 5 | SR.1.1 TDD | |
|  | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | |
|  | 2, 5 | CR.1.1 TDD | |
|  | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | |
|  | 2, 5 | CCR.1.1 TDD | |
|  | 3, 6 | CCR.2.1 TDD | |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | |
|  | 2, 5 | SSB.1 FR1 | |
|  | 3, 6 | SSB.2 FR1 | |
| SMTC configuration |  | 1, 4 | SMTC pattern 2 | |
|  | 2, 5 | SMTC pattern 1 | |
|  | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| 3, 6 | -137 | |
|  | dBm/SCS | 1, 4 | -100 | -98 |
| 2, 5 | -100 | -98 |
| 3, 6 | -97 | -95 |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.6 | -84.4 |
| 2, 5 | -103.6 | -84.4 |
| 3, 6 | -100.6 | -81.4 |
|  | dB | 1, 4 | -3.6 | 13.6 |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | -3.6 | 13.6 |
| 2, 5 |
| 3, 6 |
| SSearchThresholdP | dB | 1, 2, 3, 4, 5, 6 | 32 | 32 |
| Io | dBm/9.36 MHz | 1, 4 | -70.48 | -56.26 |
| dBm/9.36 MHz | 2, 5 | -70.48 | -56.26 |
| dBm/38.16 MHz | 3, 6 | -64.38 | -50.17 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 60 | |
| Threshx, highP | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| Threshx, low P (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, Low** which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | |

Table 6.1.2.4.5-2: Cell specific test parameters for E-UTRA cell 2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | |
| T1 | T2  T3 |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | |
|  | dBm/15 kHz | -98 | |
| RSRP | dBm/15 KHz | -82.4 | -84 |
|  | dB | 15.6 | 14 |
|  | dB | 15.6 | 14 |
| TreselectionEUTRAN | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| Threshx, highP (Note 2) | dB | 48 | |
| Threshserving, lowP | dB | 44 | |
| Threshx, lowP | dB | 50 | |
| 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: This refers to the value of Thresh**x, high** which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 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, E-UTRAN + TSI-E-UTRA,

Where:

Tevaluate, E-UTRAN See Table 4.2.2.11.3-1 in clause 4.2.2.11.3 of TS 38.133 [6]

TSI-E-UTRA 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 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling not-at-cell edge criterion.

#### 6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

6.1.2.5.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in TS 38.133 [6] clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

6.1.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting measurement enhancements in high speed scenario.

6.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.5.

6.1.2.5.4 Test description

6.1.2.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.5.4.1-1.

Table 6.1.2.5.4.1-1: Supported test configurations for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.1.2.5-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 6.1.2.5-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 6.1.2.5-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 6.1.2.5-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6.1.2.5-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6.1.2.5-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.5.4.1-2.

Table 6.1.2.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.1.2.5.4.1-3.

2. Message contents are defined in clause 6.1.2.5.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.5.4.1-3: General test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase. |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| Neighbour cells |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
| Neighbour cells |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | ms | 1, 2, 3, 4, 5, 6 | 320 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [23] |
| 4, 5, 6 | 4 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

6.1.2.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA low priority neighbour cell (Cell 2) on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. The E-UTRAN Cell 2 is indicated by NR Cell 1 as an HST cell.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* or *RRCConnectionRequest* message to perform a Registration procedure for mobility on NR Cell or E-UTRA Cell respectively.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial cell 2 physical cell identity. *highSpeedMeasFlag-r16* is provided by *SIB1* of Cell 1.

2. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. T1 starts.

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

5. If the UE responds on Cell 2 within 3 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a failure for the event “Re-select Cell 2”.

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

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

8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. T2 starts.

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

10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC\_IDLE on Cell 1. skip to 13

12. Ensure the UE is in state RRC\_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.

14. Repeat step 3-13 until a test verdict for the event “Re-select Cell 2” has been achieved, resulting in an event verdict: pass or fail. The event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. The test passes if the event pass, otherwise the test fails.

6.1.2.5.4.3 Message contents

Same as message contents in 6.1.2.2.4.3 except that

- Table H.2.3-1 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-1.

- Table H.2.3-3 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-3.

- In addition to the message contents mentioned above, exceptions given in Table 6.1.2.5.4.3-4 and Table 6.1.2.5.4.3-5 also apply.

Table 6.1.2.5.4.3-1: SIB1 (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
| Information Element | | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | |  |  |  |
| servingCellConfigCommon | | ServingCellConfigCommonSIB | Table 6.1.2.5.4.3-2 |  |
| } | |  |  |  |

Table 6.1.2.5.4.3-2: ServingCellConfigCommonSIB (Table 6.1.2.5.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 with condition HST | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| highSpeedConfig-r16 SEQUENCE { |  |  |  |
| highSpeedMeasFlag-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.2.5.4.3-3: SIB5 (Cell 1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.2.3-3 with Condition lower priority | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB5 ::= SEQUENCE { |  |  |  |
| carrierFreqListEUTRA-v1610 SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF CarrierFreqEUTRA-v1610 { | 1 entry | carrierFreqListEUTRA-v1610 and carrierFreqListEUTRA contain same number of entries. And the entries are listed in the same order |  |
| CarrierFreqEUTRA-v1610[1] SEQUENCE { |  | entry 1 |  |
| highSpeedEUTRACarrier-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.2.5.4.3-4: SystemInformationBlockType2 (Cell2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25] Table 4.4.3.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType2 ::= SEQUENCE { |  |  |  |
| radioResourceConfigCommon SEQUENCE { |  |  |  |
| highSpeedInterRAT-NR-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.1.2.5.4.3-5: SystemInformationBlockType24 (Cell2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25], Table 4.4.3.3-20 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType24-r15 ::= SEQUENCE { |  |  |  |
| carrierFreqListNR-v1610 SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1610 { | 1 entry |  |  |
| CarrierFreqNR-v1610[1] SEQUENCE { |  | entry 1 |  |
| highSpeedCarrierNR-r16 | true |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.1.2.5.5 Test requirement

Tables 6.1.2.5.4.1-3, 6.1.2.5.5-1 and 6.1.2.5.5-2 define the primary level settings including test tolerances for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 test case.

Table 6.1.2.5.5-1: NR cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | |
| --- | --- | --- | --- | --- | --- |
| **T1** | **T2** | |
| TDD configuration |  | 1, 4 | N/A | | |
|  |  | 2, 5 | TDDConf.1.1 | | |
|  |  | 3, 6 | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | |
|  |  | 2, 5 | SR.1.1 TDD | | |
|  |  | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | |
|  |  | 2, 5 | CR.1.1 TDD | | |
|  |  | 3, 6 | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | |
|  |  | 2, 5 | CCR.1.1 TDD | | |
|  |  | 3, 6 | CCR.2.1 TDD | | |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | | |
|  |  | 2, 5 | SSB.1 FR1 | | |
|  |  | 3, 6 | SSB.2 FR1 | | |
| SMTC configuration |  | 1, 4 | SMTC pattern 2 | | |
|  |  | 2, 5 | SMTC pattern 1 | | |
|  |  | 3, 6 | SMTC pattern 1 | | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A. 2.1 | | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0 | | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0 | | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
|  |  | 3, 6 | -137 | | |
|  | dBm/SCS | 1, 4 | -100 | | -98 |
|  |  | 2, 5 | -100 | | -98 |
|  |  | 3, 6 | -97 | | -95 |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.60 | -84.40 | |
|  |  | 2, 5 | -103.60 | -84.40 | |
|  |  | 3, 6 | -100.60 | -81.40 | |
|  | dB | 1, 4 | -3.6 | 13.6 | |
|  |  | 2, 5 |  |  | |
|  |  | 3, 6 |  |  | |
|  | dB | 1, 4 | -3.6 | 13.6 | |
|  |  | 2, 5 |  |  | |
|  |  | 3, 6 |  |  | |
| Io | dBm/9.36 MHz | 1, 4 | -70.46 | -56.26 | |
|  | dBm/9.36 MHz | 2, 5 | -70.46 | -56.26 | |
|  | dBm/38.16 MHz | 3, 6 | -64.38 | -50.16 | |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | | |
| Snonintrasearch | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Threshx, high (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 48 | | |
| Threshserving, low | dB | 1, 2, 3, 4, 5, 6 | 44 | | |
| Threshx, low | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, high** which is included in NR system information, and is a threshold for the E-UTRA target cell.  Note 3: Void. | | | | | |

Table 6.1.2.5.5-2: E-UTRA cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | |
|  |  | T1 | T2 |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |  | |
| PSS\_RA | dB |  | |
| SSS\_RA | dB |  | |
| PCFICH\_RB | dB |  | |
| PHICH\_RA | dB |  | |
| PHICH\_RB | dB |  | |
| PDCCH\_RA | dB |  | |
| PDCCH\_RB | dB |  | |
| PDSCH\_RA | dB |  | |
| PDSCH\_RB | dB |  | |
| OCNG\_RANote 1 | dB |  | |
| OCNG\_RBNote 1 | dB |  | |
| Qrxlevmin | dBm | -140 | |
|  | dBm/15 kHz | -98 | |
| RSRP | dBm/15 KHz | -82.40 | -84 |
|  | dB | 15.60 | 14 |
|  | dB | 15.60 | 14 |
| TreselectionEUTRAN | S | 0 | |
| Snonintrasearch | dB | Not sent | |
| Threshx, high (Note 2) | dB | 48 | |
| Threshserving, low | dB | 44 | |
| Threshx, low | dB | 50 | |
| Propagation Condition |  | AWGN 1944HzNote3 | |
| 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: This refers to the value of Thresh**x, high** which is included in E-UTRA system information, and is a threshold for the NR target cell  Note 3: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz. | | | |

The cell reselection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16* is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

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, E-UTRAN\_HST + TSI-E-UTRA,

Where:

Tevaluate, E-UTRAN\_HST = 0.96s, as defined in TS 38.133 [6] Table 4.2.2.5-2.

TSI-E-UTRA = 1.28s, is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16*.

## 6.2 RRC\_INACTIVE state mobility

### 6.2.0 General

The requirements in this clause are applicable when the UE is configured with timing alignment (TA) validation using *cg-SDT-RSRP-ChangeThreshold* for transmitting in uplink using CG-SDT as specified in TS 38.331 [13].

The requirements in this clause are applicable for the UE performing small data tranmissions using configured resources as per TS 38.331 [13].

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

The normative reference for this requirement is TS 38.133 [6] clauses 5.5.1 and 5.5.2.

#### 6.2.0.1 Minimum conformance requirements for TA validation using CG-SDT

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

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

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

RSRP1 and RSRP2 are considered valid provided that the conditions in Table 6.2.0.1-1 are met for FR1.

Table 6.2.0.1-1: Valid measurement for FR1

|  |  |
| --- | --- |
| Measurement | FR1 |
| RSRP1 | (T1 – min(640ms, M1\*TDRX)) ≤ T1’ ≤ (T1 + min(640ms, M1\*TDRX)) |
| RSRP2 | (T2 – min(640ms, M1\*TDRX)) ≤ T2’ ≤ T2 |

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

Where:

- T1 is the time when

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

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

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

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

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

- TDRX is the DRX cycle length in ms.

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

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

### 6.2.1 NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

#### 6.2.1.1 Test Purpose

The purpose of this test is to partly verify that the UE properly perform TA validation for CG-SDT transmission in 38.133 [6] clause 5.5.3.

#### 6.2.1.2 Test Applicability

This test applies to all types of NR UE release 17 and forward, supporting NR SA, CG-SDT and long DRX cycle.

#### 6.2.1.3 Minimum Conformance Requirement

The minimum requirements are specified in clause 6.2.0.1.

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

#### 6.2.1.4 Test Description

The test includes two sub-tests, Sub-test#1 for testing valid TA where UE can initiate CG-SDT transmission, and Sub-test#2 for testing invalid TA where UE does not initiate CG-SDT transmission. Subtest#2 is only tested if Sub-test#1 has passed. For each sub-test, UE is configured with CG-SDT configuration when entering RRC\_INACTIVE state. Sub-test#1 consists of four successive time periods, with time duration of T1, T2, T3 and T4, respectively. Sub-test#2 consists of two successive time periods, with time duration of T5 and T6, respectively. There is one cell, which is the active NR cell in FR1. Figure 6.2.1.4-1 shows the variation of the RSRP over the duration of Sub-test#1, and Figure 6.2.1.4-2 shows the variation of the RSRP over the duration of Sub-test#2.

A diagram of a process

Description automatically generated

Figure 6.2.1.4-1: RSRP variation model for Sub-test#1 for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

In Sub-test#1:

Prior to the time point TA, the UE shall be fully synchronized to PCell (Cell 1), be registered to the cell and have entered RRC\_CONNECTED state.

Before starting the test at time point TA, test equipment configures RSRP to P0.

At time point TB, RSRP is changed from P0 to P1.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P1 to P0.

At time point TE, RSRP is changed from P0 to P2.

Test equipment triggers UL data arrival at UE lower layer at time point TF. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG, which is W3 after TF.

After time point TG, RRC status is changed from RRC INACTIVE to RRC CONNECTED.

A diagram of a diagram

Description automatically generated

Figure 6.2.1.4-2: RSRP variation model for Sub-test#2 for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

In Sub-test#2:

Prior to the time point TA, the UE shall pass Sub-test#1 and have entered RRC connected mode. Otherwise, Sub-test#2 shall not be executed.

From time point TA to time point TD, RSRP is set to P2.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P2 to P0.

Test equipment triggers UL data arrival at UE lower layer at time point TF. TF is 3360ms after TD. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG which is W3 after TF.

W1 equals to 640ms and W2 equals to 640ms, based on requirements in clause 6.2.0. W3 is 860ms.

##### 6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.2.1.4.1-1.

Table 6.2.1.4.1-1: NR configuration for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |
| --- | --- |
| Config | Description |
| 6.2.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.2.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.2.1-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.2.1.4.1-2.

Table 6.2.1.4.1-2: Initial conditions for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 without fading | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.4 |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. Message contents are defined in clause 6.2.1.4.3.

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

3. The test parameters are given in Table 6.2.1.4.1-3. Supplementary timeline events are given in Table 6.2.1.4.1-4.

Table 6.2.1.4.1-3: General test parameters for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| TDD Configuration |  | 1 | N/A |  |
| 2 | TDDConf.1.1 |  |
| 3 | TDDConf.2.1 |  |
| BWchannel | MHz | 1,2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| PDSCH Reference measurement channel |  | 1 | SR.1.1 FDD |  |
| 2 | SR.1.1 TDD |  |
| 3 | SR.2.1 TDD |  |
| RMSI CORESET Reference Channel |  | 1 | CR.1.1 FDD |  |
| 2 | CR.1.1 TDD |  |
| 3 | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel |  | 1 | CCR.1.1 FDD |  |
| 2 | CCR.1.1 TDD |  |
| 3 | CCR.2.1 TDD |  |
| SSB configuration |  | 1,2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| OCNG Patterns |  | 1,2,3 | OP.1 |  |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 |  |
| Dedicated BWP configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 |  |
| SMTC configuration |  | 1,2,3 | SMTC.1 |  |
| DRX configuration | Ms | 1,2,3 | 640 |  |
| T1 | s | 1,2,3 | 0.4 |  |
| T2 | s | 1,2,3 | 1.28 |  |
| T3 | s | 1,2,3 | 2.72 |  |
| T4 | s | 1,2,3 | 1.5 |  |
| T5 | s | 1,2,3 | 1.68 |  |
| T6 | s | 1,2,3 | 4.22 |  |
| cg-SDT-RSRP-ChangeThreshold | dB | 1,2,3 | 14 |  |
| cg-SDT-RSRP-ThresholdSSB | dBm | 1,2 | -117 | Modified by TT analysis |
| dBm | 3 | -119 | Modified by TT analysis |
| cg-SDT-TimeAlignmentTime |  | 1,2,3 | infinity |  |
| CG-SDT resource period | ms |  | 320 | configuredGrantConfig Peridocity at 38.331 [13]  Config 1,2 : sym320x14,  config 3 : sym640x14 |
| Propagation condition |  | 1,2,3 | AWGN |  |

Table 6.2.1.4.1-4: Supplementary timeline event derivations for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time Period | Unit | Test configuration | Value | Derivation |
| T\_delay\_modeB | ms | 1,2,3 | 4000 | Test configuration for step 4 and step 9 |
| W1 | ms | 1,2,3 | 640 | Test configuration |
| W2 | ms | 1,2,3 | 640 | Test configuration |
| W3 | ms | 1,2,3 | 860 | Test configuration |
| TAtoTB | ms | 1,2,3 | 400 | Sub-test#1: TAtoTB = T1  Sub-test#2: TAtoTB = T5 – 2\*W1 |
| TBtoTC | ms | 1,2,3 | 640 | TBtoTC = W1 |
| TCtoTD | ms | 1,2,3 | 640 | TCtoTD = W1 |
| TDtoTE | ms | 1,2,3 | 2720 | Sub-test#1: TDtoTE = T3  Sub-test#2: TDtoTE = T6 – W2 – W3 |
| TEtoTF | ms | 1,2,3 | 640 | TEtoTF = W2 |
| TFtoTG | ms | 1,2,3 | 860 | TFtoTG = W3 |
| Note 1: These timeline derivations are useful to understand different timeline events other than T1, T2, T3, T4, T5 and T6. Calculations are informative. | | | | |

##### 6.2.1.4.2 Test Procedure

There is one cell in the test, the FR1 PCell, which is the active NR cell. The test parameters for the PCell are given in Table 6.2.1.4.1-1, Table 6.2.1.4.1-3, and Table 6.2.1.5-1, for Sub-test#1 and Sub-test#2, respectively. Prior to the start of each of the Sub-tests, the UE shall be fully synchronized to PCell (Cell 1). According to Table 6.2.1.5-1, in time intervals T1 to T6 the SS configures the SS-RSRP by fixing Noc and adjusting SNR correspondingly.

1. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On, Test Loop Function On and Activate UE Test Loop Mode B according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters of NR Cell according to T1 in Table 6.2.1.5-1. Propagation conditions are set according to clause C.2.3. Sub-test#1 starts. T1 starts.

3. When T1 expires the SS shall change the SS-RSRP value to T2 as specified in Table 6.2.1.5-1. T2 starts.

4. W1=640ms seconds after the start of T2 (time event TC), the SS shall send CLOSE UE TEST LOOP message for UE Test Loop Mode B and configuring T\_delay\_modeB as per Table 6.2.1.4.3-5, and transmit one PDCP SDU (which will get buffered at the UE) immediately followed by an *RRCRelease* message containing CG-SDT configuration for the UE to change its RRC state to RRC\_INACTIVE, according to section 6.2.1.4.3.

5. When T2 expires the SS shall change the SS-RSRP value to T3 as specified in Table 6.2.1.5-1. T3 starts.

6. When T3 expires the SS shall change the SS-RSRP value to T4 as specified in Table 6.2.1.5-1. T4 starts.

7. T\_delay\_modeB expires after the start of T4, at time event TF. If the UE transmits PUSCH at the next CG-SDT resource no later than TG, which is W3 seconds after TF, then the number of successful tests for CG-SDT Sub-test#1 is increased by one. Otherwise, the number of failed tests for CG-SDT Sub-test#1 is increased by one and proceed with step 12.

8. The SS shall transmit *RRCRelease*. Set the parameters of NR Cell according to T5 in Table 6.2.1.5-1. Propagation conditions are set according to clause C.2.3. Afterwards, the SS shall ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On, Test Loop Function On and Activate UE Test Loop Mode B according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Sub-test#2 starts. T5 starts.

9. W1=640ms seconds before the end of T5 (time event TC), the SS shall send CLOSE UE TEST LOOP message for UE Test Loop Mode B and configuring T\_delay\_modeB as per Table 6.2.1.4.3-5, and transmit one PDCP SDU (which will get buffered at the UE) immediately followed by an *RRCRelease* message containing CG-SDT configuration for the UE to change its RRC state to RRC\_INACTIVE, according to section 6.2.1.4.3.

10. When T5 expires the SS shall change the SS-RSRP value to T6 as specified in Table 6.2.1.5-1. T6 starts.

11. T\_delay\_modeB expires after the start of T6, at time event TF. If the UE transmits PUSCH at the next CG-SDT resource no later than TG, which is W3 seconds after TF, then the number of failed tests for CG-SDT Sub-test#2 is increased by one. Otherwise, the number of successful tests for CG-SDT Sub-test#2 is increased by one. Proceed with step 12.

12. The SS shall switch off and then on the UE and then proceed with step 13.

13. Repeat steps 1-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved for both Sub-tests. If Sub-test#1 fails, there is no need to achieve any confidence level for Sub-test#2.

6.2.1.4.3 Message Contents

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

Table 6.2.1.4.3-1: Common Exception messages for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | 38.508-1 [14] Table 4.6.1-16 with conditions NR\_RRC\_INACTIVE and SDT |

Table 6.2.1.4.3-2: *SDT-MAC-PHY-CG-Config-r17* for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [6], Table 4.6.1-16 | | | |
| Information Element | Value/remark | Comment | Condition |
| SDT-MAC-PHY-CG-Config-r17::= SEQUENCE { |  |  |  |
| cg-SDT-ConfigLCH-RestrictionToAddModList-r17 SEQUENCE (SIZE(1..maxLC-ID)) OF CG-SDT-Config-LCH-restriction-r17 { | 1 entry |  |  |
| logicalChannelIdentity-r17 | LogicalChannelIdentity with condition DRB1 |  |  |
| configuredGrantType1Allowed-r17 | true |  |  |
| allowedCG-List-r17 | Not present |  |  |
| } |  |  |  |
| cg-SDT-ConfigInitialBWP-NUL-r17 CHOICE { |  |  |  |
| setup | BWP-UplinkDedicatedSDT-r17 |  |  |
| } |  |  |  |
| cg-SDT-ConfigInitialBWP-SUL-r17 | Not present |  |  |
| cg-SDT-ConfigInitialBWP-DL-r17 |  |  |  |
| setup | BWP-DownlinkDedicatedSDT-r17 |  |  |
| } |  |  |  |
| cg-SDT-TimeAlignmentTimer-r17 | infinity |  |  |
| cg-SDT-RSRP-ThresholdSSB-r17 | 39 | -117dBm | Config 1,2 |
|  | 37 | -119dBm | Config 3 |
| cg-SDT-TA-ValiditationConfig-r17 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| cg-SDT-RSRP-ChangeThreshold-r17 | dB14 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.2.1.4.3-3: *BWP-UplinkDedicatedSDT-r17* for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| BWP-UplinkDedicatedSDT-r17::= SEQUENCE { |  |  |  |
| pusch-Config-r17 CHOICE { |  |  |  |
| setup | PUSCH-Config |  |  |
| } |  |  |  |
| configuredGrantConfigToAddModList-r17 SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfig | 1 entry |  |  |
| } |  |  |  |

Table 6.2.1.4.3-4: *ConfiguredGrantConfig* for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
| Information Element | Value/remark | Comment | Condition |
| ConfiguredGrantConfig ::= SEQUENCE { |  |  |  |
| periodicity | sym320x14 |  | Config 1,2 |
|  | sym640x14 |  | Config 3 |
| } |  |  |  |

Table 6.2.1.4.3-5: CLOSE UE TEST LOOP for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |
| --- | --- | --- |
| Derivation Path: TS 38.509 [16], clause 6.3.1 | | |
| Information Element | Value/remark | Comment |
| Protocol discriminator | 1 1 1 1 |  |
| Skip indicator | 0 0 0 0 |  |
| Message type | 1 0 0 0 0 0 0 0 |  |
| UE test loop mode | 0 0 0 0 0 0 0 1 | UE test loop mode B |
| UE test loop mode B LB setup |  |  |
| IP PDU delay | 0 0 0 0 0 1 0 0 | T\_delay\_modeB duration in seconds (4 seconds) |

#### 6.2.1.5 Test Requirement

Table 6.2.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT).

Table 6.2.1.5-1: Cell-specific test parameters for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | | | | |
|  |  |  | T1 | T2 | T3 | T4 | T5 | T6 |
|  | 1,2 | dBm/15kHz | -98.95 | -98.95 | -101 | -101 | -99.5 | -105 |
| 3 | dBm/15kHz | -98.2 | -98.2 | -101.25 | -101.25 | -103.7 | -107.95 |
|  | 1,2 | dBm/SSB SCS | -98.95 | -98.95 | -101 | -101 | -99.5 | -105 |
| 3 | dBm/SSB SCS | -95.2 | -95.2 | -98.25 | -98.25 | -100.7 | -104.95 |
|  | 1,2 | dB | 0 | 10 | 0 | 15 | 19.6 | -0.95 |
| 3 | dB | 0 | 10.5 | 0 | 15.5 | 18 | -2.8 |
| SS RSRP | 1,2 | dBm/SSB SCS | -98.95 | -88.95 | -101 | -86 | -79.9 | -105.95 |
| 3 | dBm/SSB SCS | -95.2 | -84.7 | -98.25 | -82.75 | -82.7 | -107.75 |
| Io | 1,2 | dBm/9.36MHz | -67.99 | -60.58 | -70.04 | -57.91 | -51.9 | -74.49 |
| 3 | dBm/38.16MHz | -61.13 | -53.27 | -64.18 | -51.57 | -51.58 | -72.06 |
|  | 1,2 | dB | 0 | 10 | 0 | 15 | 19.6 | -0.95 |
| 3 | dB | 0 | 10.5 | 0 | 15.5 | 18 | -2.8 |

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

During Sub-test#1, UE shall transmit PUSCH at CG-SDT resource within 860ms after time point TF.

During Sub-test#2, after passing Sub-test#1, UE shall not transmit PUSCH at CG-SDT resources after TF until the end of the test at time point TG.

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

## 6.3 RRC\_CONNECTED state mobility

### 6.3.1 Handover

#### 6.3.1.0 Minimum conformance requirements

##### 6.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

When the UE receives a RRC message implying handover to E-UTRAN the UE shall be ready to start the transmission of the uplink PRACH channel in E-UTRA within Dhandover seconds from the end of the last TTI containing the RRC command. Dhandover is defined as

Dhandover = TRRC\_procedure\_delay + Tinterruption

Where:

TRRC\_procedure\_delay: it is the RRC procedure delay, which is 50ms

Tinterruption: it is the time between end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission of the PRACH in E-UTRAN, excluding TRRC\_procedure\_delay.

When the inter-RAT handover to E-UTRAN is commanded, the interruption time shall be less than Tinterrupt

Tinterrupt = Tsearch + TIU + 20 ms

Where:

Tsearch is the time required to search the target 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 unknown and signal quality is sufficient for successful cell detection on the first attempt, then Tsearch = 80 ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to 30 ms.

NOTE: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is know 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 36.133 [6] clause [9.4.1].

The normative reference for this requirement is TS 38.133 [6] clause 6.1.2.1.

##### 6.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR1 handover

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

Where:

Dhandover equals the maximum RRC procedure delay to be defined in clause12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.2.2.

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

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

Tinterrupt = Tsearch + TIU + 20+ T∆ ms

Where:

Tsearch is the time required to search the target 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 + 2 ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥[-2] dB, then Tsearch = [3\* Trs + 2] 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.

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 [3].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs=[5]ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in 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 Clause [9.2.5] for intra-frequency handover and Clause [9.3.1] for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

##### 6.3.1.0.3 Minimum conformance requirements for NR – UTRAN handover

When the UE receives a RRC message implying handover to UTRAN the UE shall be ready to start the transmission of the new UTRA uplink DPCCH within Dhandover msfrom the end of the last NR TTI containing the RRC MobilityfromNRCommand command.

where:

- Dhandover equals the RRC procedure delay, which is 50 ms plus the interruption time stated in TS 38.133 [6] clause 6.1.2.2.3.

The interruption time is the time between the end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission on the uplink DPCCH in UTRAN, excluding the RRC procedure delay. The interruption time depends on whether the target cell is known to the UE or not.

The target cell is known if it has been measured by the UE during the last 5 seconds otherwise it is unknown. The UE shall always perform a UTRA synchronisation procedure as part of the handover procedure.

If the target cell is known the interruption time shall be less than Tinterrupt1

Tinterrupt1 = TIU+Tsync+50+ 10\*Fmax + TMC ms

If the target cell is unknown the interruption time shall be less than Tinterrupt2

Tinterrupt2 = TIU+Tsync+150 + 10\*Fmax + TMC ms

This requirement shall be met, provided that there is one target cell in the MobilityfromNRCommand command. Performance requirements for E-UTRA to UTRA soft handover are not specified. When UE is connected to an NR cell, UTRA SFN timing measurements are not reported. This implies that the timing of the DPCH of the UTRA target cells in the active set cannot be configured by UTRAN to guarantee that all target cells fall within the UE reception window of T0 +/- 148 chips.

Where:

- TIU is the interruption uncertainty when changing the timing from the NR to the new UTRAN cell. TIU can be up to one UTRA frame (10 ms).

- Fmax denotes the maximum number of radio frames within the transmission time intervals of all transport channels that are multiplexed into the same CCTrCH on the UTRA target cell. If HS-PDSCH is configured in the UTRA target cell, Fmax is 4 radio frames.

- Tsync is the time required for measuring the downlink DPCCH channel as stated in TS 25.214, clause 4.3.1.2. In case higher layers indicate the usage of a post-verification period Tsync=0 ms. Otherwise Tsync=40 ms.

- TMC is 0ms if a single UTRA cell is configured as the handover target, otherwise 20ms if handover to UTRA with 1, 2 or 3 UTRA carriers with secondary HS-PDSCH is configured.

The phase reference is the primary CPICH.

The requirements in this clause assume that N312 has the smallest possible value i.e. only one insync is required.

##### 6.3.1.0.4 Minimum conformance requirements for NR FR1- NR FR1 DAPS handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell. A DAPS handover is intra-frequency if the centre frequency of the SSB of the source cell and the centre frequency of the SSB of the target cell are the same, and the subcarrier spacing of the two SSBs are also the same.

Note 1: For intra-frequency DAPS handover, no requirement applies if active DL and UL BWP of target cell is not confined within the active DL and UL BWP of the source cell respectively.

Note 2: For inter-frequency DAPS handover, no requirement applies if the BWP of target cell is overlapped with the BWP of source cell in frequency domain.

An FR1 DAPS handover is synchronous if it meets the conditions in table 6.3.1.0.4-1, otherwise it is asynchronous

Table 6.3.1.0.4-1: Sync conditions for FR1 DAPS handover

|  |  |  |
| --- | --- | --- |
| Type of handover | Maximum receive timing difference between source and target cell (µs) for sync DAPS handover | Maximum transmit timing difference between source and target cell (µs) for sync DAPS handover |
| Intra-frequencyNote 1,2,3 | 6µs | 7.6 µs |
| Intra-band inter-frequency Note 1,2,3 | 6µs | 7.6 µs |
| Inter-band inter-frequency | 33 µs | 34.6 µs |
| Note 1: For synchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. For asynchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, interruptions may occur depending on UE implementation. The duration and frequency of occurrence of such interruptions is not specified.  Note 2: For DAPS handover on a TDD band, a UE is not expected to transmit in the uplink earlier than NRX-TX after the end of the last received downlink symbol in the same cell where NRX-TX=25600Tc.  Note 3: For DAPS handover on a TDD band, a UE is not expected to receive in the downlink earlier than NTX-RX after the end of the last transmitted uplink symbol in the same cell where NTX-RX=25600Tc. | | |

When the UE receives a RRC message implying DAPS handover to NR FR1 the UE shall be ready to start the transmission of the new uplink PRACH channel in NR within Dhandover1 seconds from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

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

Where:

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

Tsearch, TIU, Tprocessing, T∆ and Tmargin are defined in TS 38.133 [6] clause 6.1.1.2.2.

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

Dhandover2 = TRRC\_procedure+ Tinterrupt2

Where:

TRRC\_procedure is the RRC procedure delay as specified in clause 12 in TS 38.331 [2].

Tinterrupt2 is defined in TS 38.133 [6] clause 6.3.1.0.4.

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

For FR1-to-FR1 intra-frequency handover, Tinterrupt1 is specified in Table 6.3.1.0.4-2.

Table 6.3.1.0.4-2: Tinterrupt1 for FR1-to-FR1 intra-frequency DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length Tinterrupt1 (slotsNote 1), synchronous DAPS HO | Interruption length Tinterrupt1 (slotsNote 1), asynchronous DAPS HO |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 4 | 5 |
| Note 1: The same SCS of source cell and target cell is assumed.  Note 2: It is assumed that the BWP of target cell is not larger than the BWP of source cell. It is assumed that the CBW of target cell is not larger than the CBW of source cell  Note 3: Void | | | |

For FR1-to-FR1 intra-band inter-frequency handover, Tinterrupt1 is specified in Table 6.3.1.0.4-3.

Table 6.3.1.0.4-3: Tinterrupt1 for FR1-to-FR1 intra-band inter-frequency DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Tinterrupt1 (slotsNote 1), synchronous DAPS HO | Tinterrupt1 (slotsNote 1), asynchronous DAPS HO |
| 0 | 1 | 1 + TSMTC\_duration \* | 2+ TSMTC\_duration \* |
| 1 | 0.5 | 2 + TSMTC\_duration \* | 3+ TSMTC\_duration \* |
| 2 | 0.25 | 4 + TSMTC\_duration \* | 5+ TSMTC\_duration \* |
| Note 1: The same SCS of source cell and target cell is assumed.  Note 2: TSMTC\_duration measured in subframes is the longest SMTC duration between source cell and target cell.  Note 3: Void  Note 4: is as defined in TS 38.211 [6]. | | | |

For FR1-to-FR1 inter-band handover, Tinterrupt1 is specified in Table 6.3.1.0.4-4.

Table 6.3.1.0.4-4: Tinterrupt1 for FR1-to-FR1 inter-band DAPS HO

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

For FR1-to-FR1 intra-frequency handover, Tinterrupt2 is specified in Table 6.3.1.0.4-5 when the BWP of target cell is smaller than the BWP of source cell, and Tinterrupt2 is specified in Table 6.3.1.0.4-6 when the same BWP is used for target cell and source cell.

Table 6.3.1.0.4-5: Tinterrupt2 for FR1-to-FR1 intra-frequency DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X (slotsNote 1) | Tinterrupt2 (slotsNote 1) for asynchronous DAPS HO |
| 0 | 1 | 2 | 3 |
| 1 | 0.5 | 4 | 5 |
| 2 | 0.25 | 8 | 9 |
| Note 1: The same SCS of source cell and target cell is assumed.  Note 2: It is assumed that the BWP of target cell is smaller than the BWP of source cell. | | | |

Table 6.3.1.0.4-6: Tinterrupt2 for FR1-to-FR1 intra-frequency DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X (slotsNote 1) | Tinterrupt2 (slotsNote 1) for asynchronous DAPS HO |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 4 | 5 |
| Note 1: The same SCS of source cell and target cell is assumed.  Note 2: It is assumed that the BWP of target cell is the same as the BWP of source cell.  Note 3: Void | | | |

For FR1-to-FR1 intra-band inter-frequency handover, Tinterrupt2 is specified in Table 6.3.1.0.4-7.

Table 6.3.1.0.4-7: Tinterrupt2 for FR1-to-FR1 intra-band inter-frequency DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Tinterrupt2 (slotsNote 1) for synchronous DAPS HO | Tinterrupt2 (slotsNote 1) for asynchronous DAPS HO |
| 0 | 1 | 1 + TSMTC\_duration \* | 2+ TSMTC\_duration \* |
| 1 | 0.5 | 2 + TSMTC\_duration \* | 3+ TSMTC\_duration \* |
| 2 | 0.25 | 4 + TSMTC\_duration \* | 5+ TSMTC\_duration \* |
| Note 1: The same SCS of source cell and target cell is assumed.  Note 2: TSMTC\_duration measured in subframes is the longest SMTC duration between source cell and target cell.  Note 3: Void.  Note 4: is as defined in TS 38.211 [6]. | | | |

For FR1-to-FR1 inter-band handover, Tinterrupt2 is specified in Table 6.3.1.0.4-8.

Table 6.3.1.0.4-8: Tinterrupt2 for FR1-to-FR1 inter-band DAPS HO

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR slot length (ms) | Tinterrupt2 (slots) | |
|  | of target cell | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 5 | 5 |

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

#### 6.3.1.1 NR SA FR1 handover with known target cell

6.3.1.1.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra frequency handover in RRC\_CONNECTED state by meeting the delay requirement and interruption length for handover to a known target cell.

6.3.1.1.2 Test applicability

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

6.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.1.

6.3.1.1.4 Test description

6.3.1.1.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.1.4.1-1.

Table 6.3.1.1.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.1.4.1-2

Table 6.3.1.1.4.1-2: Initial conditions for NR SA FR1 handover with known target cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.1.4.1-1 | | |
| 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 6.3.1.1.4.3.

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

3. The test parameters are given in Table 6.3.1.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.1.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | | dB | -1 | Original Value 0dB, post TT Analysis, its -1 dB |
| 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 |  |

6.3.1.1.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells as given in tables 6.3.1.1.4.1-3 and 6.3.1.1.5-1. No gap patterns are configured in the test case. 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 does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send measurement report A3. An RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

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

2. Set the parameters according to T1 in Table 6.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message, 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 6.3.1.15-1.

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

7. SS shall transmit the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.1.5-1. T3 starts.

8. The UE shall transmit RRCReconfigurationComplete message.

9. 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.

10. 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.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.

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

6.3.1.1.4.3 Message contents

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

Table 6.3.1.1.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2  Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3  Table H.3.1-4 with A3-offset = -1dB  Table H.3.1-5  Table H.3.1-7 with Condition INTRA-FREQ  Table H.3.2-2 with Condition RBConfig\_KeyChange |

6.3.1.1.5 Test requirements

Table 6.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.1.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

| **Parameter** | | | | **Unit** | **Cell 1** | | | | | | **Cell 2** | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **T1** | | **T2** | | **T3** | | **T1** | | **T2** | | **T3** |
| NR RF Channel Number | | | |  | 1 | | | | | | 1 | | | | |
| Duplex mode | | | Config 1 |  | FDD | | | | | | | | | | |
| Config 2,3 | TDD | | | | | | | | | | |
| TDD configuration | | | Config 1 |  | Not Applicable | | | | | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | | | | | |
| BWchannel | | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | | | | | |
| BWP BW | | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | | | | | |
| DRx Cycle | | | | ms | Not Applicable | | | | | | | | | | |
| PDSCH Reference measurement channel | | | Config 1 |  | SR.1.1 FDD | | | | | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | | | | | |
| CORESET Reference Channel | | | Config 1 |  | CR.1.1 FDD | | | | | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | | | | | |
| TRS configuration | | | Config 1 |  | TRS.1.1 FDD | | | | | | | | | | |
| Config 2 |  | TRS.1.1 TDD | | | | | | | | | | |
| Config 3 |  | TRS.1.2 TDD | | | | | | | | | | |
| OCNG Patterns | | | |  | OP.1 | | | | | | | | | | |
| SMTC Configuration | | | |  | SMTC.1 | | | | | | | | | | |
| SSB Configuration | | | Config 1,2 |  | SSB.1 FR1 | | | | | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | |
| Config 3 | 30 kHz | | | | | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | |
| Config 3 | 30 kHz | | | | | | | | | | |
| PRACH configuration | | | |  | PRACH.1 FR1 | | | | | | | | | | |
| BWP configuration | | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | | | | dBm/15kHz | -98 | | | | | -98 | | | | | |
| Note2 | Config 1,2 | | | dBm/SCS | -98 | | | | | -98 | | | | | |
| Config 3 | | | -95 | | | | | -95 | | | | | |
|  | Config 1,2 | | | dB | 8 | -2.41 | | -2.41 | | -Infinity | | 1.36 | | 1.36 | |
| Config 3 | | | dB | 8 | -2.41 | | -2.41 | | -Infinity | | 1.36 | | 1.36 | |
|  | Config 1,2 | | | dB | 8 | 8 | | 8 | | -Infinity | | 10 | | 10 | |
| Config 3 | | | dB | 8 | 8 | | 8 | | -Infinity | | 10 | | 10 | |
| SSB\_RP | | Config 1,2 | | dBm/SCS | -90 | -90 | | -90 | | Infinity | | -88 | | -88 | |
| Config 3 | | dBm/SCS | -87 | -87 | | -87 | | Infinity | | -84.99 | | -84.99 | |
| IoNote3 | Config 1,2 | | | dBm/  9.36MHz | -61.41 | -57.67 | | -57.67 | | -61.41 | | -57.67 | | -57.67 | |
| Config 3 | | | dBm/  38.16MHz | -55.31 | -51.56 | | -51.56 | | -55.31 | | -51.56 | | -51.56 | |
| 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 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 [2].

Tinterrupt = 62 ms in the test. Tinterrupt is defined in clause 6.3.1.0.2.

This gives a total of 72 ms.

#### 6.3.1.2 NR SA FR1 handover with unknown target cell

6.3.1.2.1 Test purpose

To verify the UE’s ability to perform NR FR1-NR FR1 intra frequency handover in RRC\_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

6.3.1.2.2 Test applicability

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

6.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.2.4 Test description

6.3.1.2.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.2.4.1-1.

Table 6.3.1.2.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.2.4.1-2

Table 6.3.1.2.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.2.4.1-1 | | |
| 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 6.3.1.2.4.3.

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

3. The test parameters are given in Table 6.3.1.2.4.1-4 below.

Table 6.3.1.2.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1

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

6.3.1.2.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells on the carrier as given in tables 6.3.1.2.4.1-3 and 6.3.1.2.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

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

2. Set the parameters according to T1 in Table 6.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

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

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.2.5-1. T2 starts.

5. The UE shall transmit RRCReconfigurationComplete message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 92 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off 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.

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

6.3.1.2.4.3 Message contents

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

Table 6.3.1.2.4.3-1: Common Exception messages

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

6.3.1.2.5 Test requirements

Table 6.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.2.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

| **Parameter** | | | **Unit** | **Cell 1** | | | | **Cell 2** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **T1** | | **T2** | | **T1** | | **T2** |
| NR RF Channel Number | | |  | 1 | | | | 1 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
| Config 2,3 | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | |
| Config 3 | TDDConf. 2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
| Config 2 | TRS.1.1 TDD | | | | | | |
| Config 3 | TRS.1.2 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC Configuration | | |  | SMTC.1 FR1 | | | | | | |
| SSB configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | PRACH.1 FR1 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | -98 | | | |
| Config 3 | | -95 | | | -95 | | | |
|  | | | dB | 8 | -0.64 | | -Infinity | | -0.64 | |
|  | | | dB | 8 | 8 | | -Infinity | | 8 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -Infinity | | -90 | |
| Config 3 | | dBm/SCS | -87 | -87 | | -Infinity | | -87 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -57.95 | | -61.41 | | -57.95 | |
| Config 3 | | dBm/  38.16MHz | -55.31 | -51.84 | | -55.31 | | -51.84 | |
| 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 92 ms from the beginning of time period T2.

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

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

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

Tinterrupt = 82 ms in the test. Tinterrupt is defined in clause 6.3.1.0.2.

This gives a total of 92 ms.

#### 6.3.1.3 NR SA FR1-FR1 handover with unknown target cell

6.3.1.3.1 Test purpose

To verify the UE’s ability to perform NR FR1-NR FR1 inter frequency handover in RRC\_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

6.3.1.3.2 Test applicability

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

6.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.3.

6.3.1.3.4 Test description

6.3.1.3.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.3.4-1.

Table 6.3.1.3.4.1-1: Inter-frequency handover from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.3.4-2

Table 6.3.1.3.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.3.4-3 | | |
| 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 6.3.1.3.4.3.

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

3. The test parameters are given in Tables 6.3.1.3.4.1-3 and 6.3.1.3.5-1 below.

Table 6.3.1.3.4.1-3: General test parameters Inter-frequency handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |

6.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 6.3.1.3.4-3 and 6.3.1.3.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

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

2. Set the parameters according to T1 in Table 6.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

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

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.3.5-1. T2 starts.

5. The UE shall transmit RRCReconfigurationComplete message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 132 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off 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.

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

6.3.1.3.4.3 Message contents

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

Table 6.3.1.3.4.3-1: Common Exception messages

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

6.3.1.3.5 Test requirements

Table 6.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.3.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

| **Parameter** | | | **Unit** | **Cell 1** | | | | **Cell 2** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **T1** | | **T2** | | **T1** | | **T2** |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
| Config 2,3 | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
| Config 2 | TRS.1.1 TDD | | | | | | |
| Config 3 | TRS.1.2 TDD | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC configuration | | Config 1,2 |  | SMTC.1 FR1 | | | | | | |
| Config 3 | SMTC.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | -98 | | | |
| Config 3 | | -95 | | | -95 | | | |
|  | | | dB | 4 | 4 | | -Infinity | | 5 | |
|  | | | dB | 4 | 4 | | -Infinity | | 5 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -94 | -94 | | -Infinity | | -93 | |
| Config 3 | | dBm/SCS | -91 | -91 | | -Infinity | | -90 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 | -64.59 | | -70.05 | | -63.85 | |
| Config 3 | | dBm/  38.16MHz | -58.49 | -58.49 | | -63.94 | | -57.75 | |
| 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 132 ms from the beginning of time period T2.

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

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

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

Tinterrupt = 122 ms in the test. Tinterrupt is defined in clause 6.3.1.0.2.

This gives a total of 132 ms.

#### 6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell

6.3.1.4.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.4.2 Test applicability

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

6.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.4.

6.3.1.4.4 Test description

6.3.1.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.4.4.1-1.

Table 6.3.1.4.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 6.3.1.4-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.3.1.4-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.4-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.4-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.3.1.4-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.3.1.4-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.4.4.1-2.

Table 6.3.1.4.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with known target cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.3.1.4.4.1-3.

2. Message contents are defined in clause 6.3.1.4.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.1.4.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | NR cell |
| Neighbouring cell |  | Cell 2 | E-UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | |  | RSRP |  |
| b2-Threshold1 | | dBm | As specified in Table 6.3.1.4.5-1 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2EUTRAN | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | | dB | 0 |  |
| TimeToTrigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | |  | 0 | As specified in TS 38.133 [6], table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

6.3.1.4.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. 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 does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the next instant after the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

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. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.4.5-1 and 6.3.1.4.5-2. T1 starts.

3. The SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.

6. UE shall transmit a MeasurementReport message triggered by Event B2.

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

8. The start of T3 is the next instant after the last TTI containing the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.

9. The UE shall transmit RRCConnectionReconfigurationComplete message on Cell 2.

10. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 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.

11. 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.

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

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

6.3.1.4.4.3 Message contents

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

Table 6.3.1.4.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-2 with Condition INTER-RAT and GAP NEEDED  Table H.3.1-3A  Table H.3.1-4A  Table H.3.1-5  Table H.3.1-6 with Condition Pattern #0  Table H.3.1-7 with Condition INTER-RAT  Table H.3.3-1 |
| Specific message contents exceptions for Test Configuration 6.3.1.4-1, 6.3.1.4-2, 6.3.1.4-4 and 6.3.1.4-5 | Table H.3.1-3 with Condition SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.1.4-3 and 6.3.1.4-6 | Table H.3.1-3 with Condition SSB.2 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 6.3.1.4.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN known cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25], Table 4.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| PRACH-Config-DEFAULT ::= SEQUENCE { |  |  |  |
| prach-ConfigInfo SEQUENCE { |  |  |  |
| prach-ConfigIndex | 4 |  | Config 1, 2, 3 |
|  | 53 |  | Config 4, 5, 6 |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.4.4.3-3: *RRCConnectionReconfiguration*: Inter-RAT handover to E-UTRAN known cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25], Table 4.6.1-8 | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { |  |  |  |
| securityConfigHO | Not present |  |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v890-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v920-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1020-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1130-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1250-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1310-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1430-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1510-IEs |  |
| nonCriticalExtension SEQUENCE { |  | RRCConnectionReconfiguration-v1530-IEs |  |
| securityConfigHO-v1530 { |  |  |  |
| handoverType-v1530 CHOICE { | fivegc-ToEPC-r15 |  |  |
| fivegc-ToEPC-r15 { |  |  |  |
| securityAlgorithmConfig-r15 { |  |  |  |
| cipheringAlgorithm | eea0 |  |  |
| integrityProtAlgorithm | eia1 |  |  |
| } |  |  |  |
| nextHopChainingCount-r15 | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.3.1.4.5 Test requirement

Tables 6.3.1.4.4.1-3, 6.3.1.4.5-1 and 6.3.1.4.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.4.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Configuration | Cell 1 | | |
|  | |  |  | T1 | T2 | T3 |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | |  | 1, 4 | FDD | | |
|  | |  | 2, 3, 5, 6 | TDD | | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | | |
|  | |  | 3, 6 | TDDConf.2.1 | | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | | |
|  | |  | 2, 5 | 10: NRB,c = 52 (TDD) | | |
|  | |  | 3, 6 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | | |
|  | |  | 2, 5 | SR.1.1 TDD | | |
|  | |  | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | | |
|  | |  | 2, 5 | CR.1.1 TDD | | |
|  | |  | 3, 6 | CR.2.1 TDD | | |
| TRS configuration | |  | 1, 4 | TRS.1.1 FDD | | |
|  | |  | 2, 5 | TRS.1.1 TDD | | |
|  | |  | 3, 6 | TRS.1.2 TDD | | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | | |
|  | |  | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -94 | | |
|  | |  | 3, 6 | -91 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -100 | -104 | -100 |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -100 | -104 | -100 |
|  | |  | 3, 6 | -97 | -101 | -97 |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | 0 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | 0 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 | -100 |
|  | |  | 3, 6 | -85 | -101 | -97 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.78 | -73.04 | -69.04 |
|  | | dBm/38.16 MHz | 3, 6 | -53.68 | -66.93 | -62.93 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table 6.3.1.4.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

| Parameter | Unit | Configuration | Cell 2 | | |
| --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode |  | 1, 2, 3 | FDD | | |
| 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: NRB,c = 25  10MHz: NRB,c = 50  20MHz: NRB,c = 100 | | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | | |
| 4, 5, 6 | 53 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5MHz: R.7 FDD  10MHz: R.3 FDD  20MHz: R.6 FDD | | |
| 4, 5, 6 | 5MHz: R.4 TDD  10MHz: R.0 TDD  20MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5MHz: R.11 FDD  10MHz: R.6 FDD  20MHz: R.10 FDD | | |
| 4, 5, 6 | 5MHz: R.11 TDD  10MHz: R.6 TDD  20MHz: R.10 TDD | | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5MHz: OP.20 FDD  10MHz: OP.10 FDD  20MHz: OP.17 FDD | | |
| 4, 5, 6 | 5MHz: OP.9 TDD  10MHz: OP.1 TDD  20MHz: OP.7 TDD | | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 9.55 | 9.55 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 9.55 | 9.55 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -88.45 | -88.45 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -88.45 | -88.45 |
| IoNote6 | dBm/Ch BW | 1, 2, 3, 4, 5, 6 | -67.21  +10log  (NRB,c /100) | -57.20  +10log  (NRB,c /100) | -57.20  +10log  (NRB,c /100) |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211[24].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211[24].  Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [6] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: 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 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27]. | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 85 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 = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

Tinterrupt = 35 ms in the test; Tinterrupt is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 85 ms.

#### 6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell

6.3.1.5.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in section 6.1.2.1 of TS 38.133 [6].

6.3.1.5.2 Test applicability

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

6.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.5.4 Test description

6.3.1.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.5.4.1-1.

Table 6.3.1.5.4.1-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 6.3.1.5-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.3.1.5-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.5-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.5-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.3.1.5-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.3.1.5-6 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.5.4.1-2.

Table 6.3.1.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with unknown target cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameter settings are set up according to Table 6.3.1.5.4.1-3.

2. Message contents are defined in clause 6.3.1.5.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2. Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.1.5.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | NR cell |
| Neighbouring cell |  | Cell 2 | E-UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | |  | RSRP |  |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | ≤5 |  |
| T2 | | s | 1 |  |

6.3.1.5.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

An RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last subframe containing the RRC message implying handover is sent to the UE. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to 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. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T1 starts.

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

4. The start of T2 is the instant when the last subframe containing the RRC Reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T2 starts.

5. The UE shall transmit RRCConnectionReconfigurationComplete message on Cell 2.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 165 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off 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.

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

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

6.3.1.5.4.3 Message contents

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

Table 6.3.1.5.4.3-1: Common Exception messages

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.3-1 |

Table 6.3.1.5.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN unknown cell

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 36.508 [25], Table 4.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| PRACH-Config-DEFAULT ::= SEQUENCE { |  |  |  |
| prach-ConfigInfo SEQUENCE { |  |  |  |
| prach-ConfigIndex | 4 |  | Config 1, 2, 3 |
|  | 53 |  | Config 4, 5, 6 |
| } |  |  |  |
| } |  |  |  |

6.3.1.5.5 Test requirement

Tables 6.3.1.5.4.1-3, 6.3.1.5.5-1 and 6.3.1.5.5-2 define the primary level settings including test tolerances for inter-RAT E-UTRAN handover: unknown target cell test.

Table 6.3.1.5.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Configuration | Cell 1 | |
| T1 | T2 |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | |  | 1, 4 | FDD | |
| 2, 3, 5, 6 | TDD | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | |
| 3, 6 | TDDConf. 2.1 | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | |
| 2, 5 | 10: NRB,c = 52 (TDD) | |
| 3, 6 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | |
| 2, 5 | SR.1.1 TDD | |
| 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | |
| 2, 5 | CR.1.1 TDD | |
| 3, 6 | CR.2.1 TDD | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Dedicated DL BWP | DLBWP.1.1 | |
| Initial UL BWP | ULBWP.0.1 | |
| Dedicated UL BWP | ULBWP.1.1 | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | |
| 3, 6 | SSB.2 FR1 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSS | |
| EPRE ratio of OCNG to OCNG DMRS | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -98 | |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -98 | |
| 3, 6 | -95 | |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | 0 | 0 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | 0 | 0 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -98 | -98 |
|  | | 3, 6 | -95 | -95 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -67.04 | -67.04 |
| dBm/38.16 MHz | 3, 6 | -60.94 | -60.94 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table 6.3.1.5.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 2 | |
| T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: NRB,c = 25  10MHz: NRB,c = 50  20MHz: NRB,c = 100 | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | |
| 4, 5, 6 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5MHz: R.7 FDD  10MHz: R.3 FDD  20MHz: R.6 FDD | |
| 4, 5, 6 | 5MHz: R.4 TDD  10MHz: R.0 TDD  20MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5MHz: R.11 FDD  10MHz: R.6 FDD  20MHz: R.10 FDD | |
| 4, 5, 6 | 5MHz: R.11 TDD  10MHz: R.6 TDD  20MHz: R.10 TDD | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5MHz: OP.20 FDD  10MHz: OP.10 FDD  20MHz: OP.17 FDD | |
| 4, 5, 6 | 5MHz: OP.9 TDD  10MHz: OP.1 TDD  20MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -91 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -91 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -62.43 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.  Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: 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 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27]. | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

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

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

Tinterrupt = 115 ms in the test; Tinterrupt is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 165 ms.

#### 6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell

6.3.1.6.1 Test purpose

To verify that the UE can make correct inter-RAT UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support UTRA FDD.

6.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.6.

6.3.1.6.4 Test description

6.3.1.6.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.6.4.1-1.

Table 6.3.1.6.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 6.3.1.6-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, UTRAN FDD |
| 6.3.1.6-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, UTRAN FDD |
| 6.3.1.6-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, UTRAN FDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.6.4.1-2.

Table 6.3.1.6.4.1-2: Initial conditions for NR SA FR1 – UTRAN handover with known target cell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-3 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.6.4.1-1. | | |
| 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. |
| UE Part | A.3.2.3.2 |
| Exceptions to connection diagram | SS LTE in Figure A.3.1.8.2 is replaced by SS UTRA  Faders in Figure A.3.1.8.2 are removed.  LTE TX/RX in Figure A.3.2.3.2 is replaced by UTRA TX/RX | |  |

1. The general test parameter settings are set up according to Table 6.3.1.6.4.1-3.

2. Message contents are defined in clause 6.3.1.6.4.3.

3. The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 Annex C.0 and C.1.

Table 6.3.1.6.4.1-3: General test parameters for SA inter-RAT UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | 1 NR carrier frequency is used in the test |
| UTRA RF Channel Number | |  | 2 | 1 UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | NR cell |
|  | Neighbouring cell |  | Cell 2 | UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| Inter-RAT (UTRAN FDD) measurement quantity | |  | CPICH Ec/N0 |  |
| b2-Threshold1 | | dBm | As specified in Table 6.3.1.6.5-1 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2UTRA-FDD | | dB | -18 | Absolute UTRAN CPICH Ec/Io threshold for event B2 |
| Hysteresis | | dB | 0 |  |
| TimeToTrigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | |  | 0 | As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

6.3.1.6.4.2 Test procedure

The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. 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 does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

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 6.3.1.6.5-1 and 6.3.1.6.5-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message to configure Event B2 measurement reporting.

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 6.3.1.6.5-1 and 6.3.1.6.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2.

7. SS shall transmit a *MobilityFromNRCommand* message implying handover to Cell 2.

8. T3 starts when the last TTI containing the *MobilityFromNRCommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.6.5-1 and 6.3.1.6.5-2.

9. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 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.

10. The UE shall transmit HANDOVER TO UTRAN COMPLETE messageon Cell 2.

11. 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.

12. The SS shall set Cell 2 primary scrambling code = ((current cell 2 primary scrambling code - 50) mod 200 + 100) for next iteration of the test procedure loop.

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

6.3.1.6.4.3 Message contents

Table 6.3.1.6.4.3-1: RRCReconfiguration (Step 3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| measConfig | | MeasConfig | Table 6.3.1.6.4.3-2 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.3.1.6.4.3-2: MeasConfig (Table 6.3.1.6.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 2 entries |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO |  |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod[2] SEQUENCE { |  | entry 2 |  |
| measObjectId | 2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA-FDD-r16 | MeasObjectUTRA-FDD | Table 6.3.1.6.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigInterRAT | ReportConfigInterRAT(*13, 60*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT\_B2\_UTRA | Actual value of thresholds are:  UTRA threshold = (13-49)/2 = -18dB  NR threshold = 60-156 = -96dBm | 6.6.1.6-1,  6.6.1.6-2 |
|  | ReportConfigInterRAT(*13, 63*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT\_B2\_UTRA | Actual value of thresholds are:  UTRA threshold = (13-49)/2 = -18dB  NR threshold = 63-156 = -93dBm | 6.6.1.6-3 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 |  |  |
| } |  |  |  |

Table 6.3.1.6.4.3-3: MeasObjectUTRA-FDD (Table 6.3.1.6.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77A | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectUTRA-FDD-r16 ::= SEQUENCE { |  |  |  |
| carrierFreq-r16 | ARFCN-ValueUTRA-FDD-r16 for UTRA Cell 2 |  |  |
| } |  |  |  |

Table 6.3.1.6.4.3-4: MeasurementReport (Step 6)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
| Information Element | | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| measurementReport SEQUENCE { | |  |  |  |
| measResults | | MeasResults | Table 6.3.1.6.4.3-5 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.3.1.6.4.3-5: MeasResults (Table 6.3.1.6.4.3-4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.3-79 with condition B2\_UTRA | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA-FDD-r16 SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA-FDD-r16 { | 1 entry |  |  |
| MeasResultUTRA-FDD-r16[1] SEQUENCE { |  | entry 1 |  |
| physCellId-r16 | PhysCellIdUTRA-FDD-r16 of UTRA Cell 2 |  |  |
| measResult-r16 SEQUENCE { |  |  |  |
| utra-FDD-EcN0-r16 | INTEGER (0..49) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.6.4.3-6: MobilityFromNRCommand (Step 7)

|  |
| --- |
| Derivation Path: TS 38.508-1 [14] Table 4.6.1-8 with condition HO-TO-UTRA\_FDD |

6.3.1.6.5 Test requirement

Tables 6.3.1.6.5-1 and 6.3.1.6.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.6.5-1: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 1)

| Parameter | | Unit | Configuration | Cell 1 | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | |  |  | T1 | T2 | T3 |
| RF channel number | |  | 1, 2, 3 | 1 | | |
| Duplex mode | |  | 1 | FDD | | |
|  | |  | 2, 3 | TDD | | |
| TDD Configuration | |  | 2 | TDDConf.1.1 | | |
|  | |  | 3 | TDDConf.2.1 | | |
| BWchannel | | MHz | 1 | 10: NRB,c = 52 (FDD) | | |
|  | |  | 2 | 10: NRB,c = 52 (TDD) | | |
|  | |  | 3 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement channel | |  | 1 | SR.1.1 FDD | | |
|  | |  | 2 | SR.1.1 TDD | | |
|  | |  | 3 | SR.2.1 TDD | | |
| CORSET reference channel | |  | 1 | CR.1.1 FDD | | |
|  | |  | 2 | CR.1.1 TDD | | |
|  | |  | 3 | CR.2.1 TDD | | |
| TRS configuration | |  | 1 | TRS.1.1 FDD | | |
|  | |  | 2 | TRS.1.1 TDD | | |
|  | |  | 3 | TRS.1.2 TDD | | |
| OCNG patternNote1 | |  | 1, 2, 3 | OP.1 | | |
| BWP | Initial DL BWP |  | 1, 2, 3 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | |
| SMTC configuration | |  | 1, 2, 3 | SMTC.1 | | |
| SSB configuration | |  | 1, 2 | SSB.1 FR1 | | |
|  | |  | 3 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2 | -96 | | |
|  | |  | 3 | -93 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3 | -101.54 | | |
| *Noc*Note2 | | dBm/SCS | 1, 2, | -101.54 | | |
|  | |  | 3 | -98.54 | | |
| Ês/Noc | | dB | 1, 2, 3 | 12 | -4 | -4 |
| Ês/IotNote3 | | dB | 1, 2, 3 | 12 | -4 | -4 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2 | -89.54 | -105.54 | -105.54 |
|  | |  | 3 | -86.54 | -102.54 | -102.54 |
| IoNote3 | | dBm/9.36 MHz | 1, 2 | -61.32 | -72.13 | -72.13 |
|  | | dBm/38.16 MHz | 3 | -55.22 | -66.03 | -66.03 |
| Propagation condition | |  | 1, 2, 3 | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table 6.3.1.6.5-2: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 2 (UTRA) | | |
|  |  | T1 | T2 | T3 |
| UTRA RF Channel Number |  | 2 | | |
| CPICH\_Ec/Ior | dB | -10 | | |
| PCCPCH\_Ec/Ior | dB | -12 | | |
| SCH\_Ec/Ior | dB | -12 | | |
| PICH\_Ec/Ior | dB | -15 | | |
| DCH\_Ec/Ior | dB | N/A | N/A | Note 1 |
| OCNS\_Ec/Ior | dB | -0.941 | 0.941 | Note 2 |
|  | dB | ‑infinity | -1.8 | -1.8 |
|  | dBm/3,84 MHz | ‑70 | -70 | -70 |
| CPICH\_Ec/Io | dB | ‑infinity | -14 | -14 |
| Propagation Condition |  | AWGN | | |
| Note 1: The DPCH level is controlled by the power control loop  Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to Ior . | | | | |

The UE shall start to transmit the UL DPCCH to Cell 2 less than 190 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 = 50 ms, which is specified in clause 5.3.1.1.1.

Tinterrupt = 140 ms in the test; Tinterrupt is defined in clause 5.3.1.1.2. This gives a total of 190 ms.

#### 6.3.1.7 NR SA FR1 synchronous DAPS handover

6.3.1.7.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.7.2 Test applicability

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

6.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.7.

6.3.1.7.4 Test description

6.3.1.7.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.7.4.1-1.

Table 6.3.1.7.4.1-1: NR SA FR1 synchronous DAPS handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 6.3.1.7-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.7-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.7-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.7.4.1-2

Table 6.3.1.7.4.1-2: Initial conditions for NR SA FR1 synchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.7.4.1-1 | | |
| 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 6.3.1.7.4.3.

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

3. The test parameters are given in Table 6.3.1.7.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.7.4.1-3: General test parameters for NR SA FR1 synchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | | dB | -1 |  |
| 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 |  |
| T4 | | ms | Dhandover2 | DHandover2 is defined in TS 38.133 [6] clause 6.1.3.2.1 |
| T5 | | ms | 100 |  |

6.3.1.7.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.7.4.1-3 and 6.3.1.7.5-1 respectively. No measurement gap is configured in the test case. Both Cell 1 and Cell 2 belong to the same TAG.

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

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

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

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

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within Dhandover2

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

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

2. Set the parameters according to T1 in Table 6.3.1.7.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-frequency carrier and periodical CSI reporting on Cell 1.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.7.5-1.

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

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.7.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

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

- Dhandover1 = 72 ms.

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

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

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

13. When T4 expires, T5 starts.

15. If

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

and

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

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

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

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

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

6.3.1.7.4.3 Message contents

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

Table 6.3.1.7.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| measConfig | MeasConfig | Table 6.3.1.7.4.3-3 |  |
| nonCriticalExtension SEQUENCE { |  |  |  |
| masterCellGroup SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.7.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.7.4.3-2: ServingCellConfig (Table 6.3.1.7.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

Table 6.3.1.7.4.3-3: MeasConfig (Table 6.3.1.7.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfig[1] CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR(-1) specified in Table H.3.1-4 | Acutal value of A3-offset is -1dB |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.7.4.3-4: MeasurementReport (Step 7)

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

Table 6.3.1.7.4.3-5: RRCReconfiguration(Step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig\_NoKeyChange | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.7.4.3-6 |  |
| nonCriticalExtension SEQUENCE{ |  |  |  |
| masterCellGroup | CellGroupConfig | Table 6.3.1.7.4.3-7 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.7.4.3-6: RadioBearerConfig (Table 6.3.1.7.4.3-5)

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

Table 6.3.1.7.4.3-7: CellGroupConfig (Table 6.3.1.7.4.3-6)

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

Table 6.3.1.7.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.7.5 Test requirements

Table 6.3.1.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.7.5-1: Cell specific test parameters for NR SA FR1 synchronous DAPS handover

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | Cell 2 | |
|  | | |  | T1 | T2 – T5 | T1 | T2 – T5 |
| NR RF Channel Number | | |  | 1 | | | |
| Duplex mode | | Config 1 |  | FDD | | | |
| Config 2,3 |  | TDD | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | |
| Config 2 |  | TDDConf.1.1 | | | |
| Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | |
| Config 2 |  | 10: NRB,c = 52 | | | |
| Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | |
| Config 2 |  | 10: NRB,c = 52 | | | |
| Config 3 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | |
| Config 2 |  | SR.1.1 TDD | | | |
| Config 3 |  | SR.2.1 TDD | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | |
| Config 2 |  | CR.1.1 TDD | | | |
| Config 3 |  | CR.2.1 TDD | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | |
| Config 2 |  | TRS.1.1 TDD | | | |
| Config 3 |  | TRS.1.2 TDD | | | |
| OCNG Patterns | | |  | OP.1 | | | |
| CSI-RS configuration for CSI reporting | | Config 1 |  | CSI-RS.1.1 FDD | | | |
| Config 2 |  | CSI-RS.1.1 TDD | | | |
| Config 3 |  | CSI-RS.2.1 TDD | | | |
| reportConfigType | | |  | periodic | | N/A | |
| reportQuantity | | |  | cri-RI-PMI-CQI | | N/A | |
| CSI reporting periodicity | | Config 1,2 | slot | 5 | | N/A | |
| Config 3 |  | 10 | | N/A | |
| CSI reporting offset | | Config 1,2 | slot | 3 | | N/A | |
| Config 3 |  | 5 | | N/A | |
| SMTC Configuration | | |  | SMTC.1 | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | |
| Config 3 | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |
| EPRE ratio of PDSCH to PDSCH | | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |
| Note2 | | | dBm/15kHz | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | |
| Config 3 | | -95 | | | |
|  | | | dB | 8 | -2.41 | -Infinity | 1.36 |
|  | | | dB | 8 | 8 | -Infinity | 10 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | -Infinity | -88 |
| Config 3 | | dBm/SCS | -87 | -87 | -Infinity | -85 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| Config 3 | | dBm/  38.16MHz | -55.31 | -51.56 | -55.31 | -51.56 |
| Propagation condition | | |  | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: 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 Dhandover1 from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

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

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

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

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

- Tprocessing = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

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

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

This gives a total of 72 ms.

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

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

Dhandover2= TRRC\_procedure + Tinterrupt2

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

- Tinterrupt2 = 1 ms for sync intra-frequency DAPS handover, is the allowed interruption length during Dhandover2 as in 38.133 [13] clause 6.1.3.2.2;

This gives a total of 11 ms.

UE shall not report CSI to Cell 1 during T5.

#### 6.3.1.8 NR SA FR1 asynchronous DAPS handover

6.3.1.8.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.8.2 Test applicability

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

6.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.8.

6.3.1.8.4 Test description

6.3.1.8.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.8.4.1-1.

Table 6.3.1.8.4.1-1: NR SA FR1 asynchronous DAPS handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 6.3.1.8-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.8-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.8-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.8.4.1-2

Table 6.3.1.8.4.1-2: Initial conditions for NR SA FR1 asynchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.8.4.1-1 | | |
| 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 6.3.1.8.4.3.

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

3. The test parameters are given in Table 6.3.1.8.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.8.4.1-3: General test parameters for NR SA FR1 asynchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | | dB | -1 |  |
| 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 | |  | 7 μs | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |
| T4 | | ms | Dhandover2 | DHandover2 is defined in TS 38.133 [6] clause 6.1.3.2.1 |
| T5 | | ms | 100 |  |

6.3.1.8.4.2 Test procedure

Same test procedure as described in section 6.3.1.7.4.2.

6.3.1.8.4.3 Message contents

Same message contents as described in section 6.3.1.7.4.3.

6.3.1.8.5 Test requirements

Table 6.3.1.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.8.5-1: Cell specific test parameters for NR SA FR1 asynchronous DAPS handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | | Cell 1 | | Cell 2 | |
|  | | | | |  | | T1 | T2 – T5 | T1 | T2 – T5 |
| NR RF Channel Number | | | | |  | | 1 | | | |
| Duplex mode | | | Config 1 | |  | | FDD | | | |
| Config 2,3 | |  | | TDD | | | |
| TDD configuration | | | Config 1 | |  | | Not Applicable | | | |
| Config 2 | |  | | TDDConf.1.1 | | | |
| Config 3 | |  | | TDDConf.2.1 | | | |
| BWchannel | | | Config 1,2 | | MHz | | 10: NRB,c = 52 | | | |
| Config 3 | |  | | 40: NRB,c = 106 | | | |
| BWP BW | | | Config 1 | | MHz | | 10: NRB,c = 52 | | | |
| Config 3 | |  | | 40: NRB,c = 106 | | | |
| DRX Cycle | | | | | ms | | Not Applicable | | | |
| PDSCH Reference measurement channel | | | Config 1 | |  | | SR.1.1 FDD | | | |
| Config 2 | |  | | SR.1.1 TDD | | | |
| Config 3 | |  | | SR.2.1 TDD | | | |
| CORESET Reference Channel | | | Config 1 | |  | | CR.1.1 FDD | | | |
| Config 2 | |  | | CR.1.1 TDD | | | |
| Config 3 | |  | | CR.2.1 TDD | | | |
| TRS configuration | | | Config 1 | |  | | TRS.1.1 FDD | | | |
| Config 2 | |  | | TRS.1.1 TDD | | | |
| Config 3 | |  | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | | |  | | OP.1 | | | |
| CSI-RS CSI | | Config 1 | |  | | CSI-RS.1.1 FDD | | | | |
| configuration for | | Config 2 | |  | | CSI-RS.1.1 TDD | | | | |
| reporting | | Config 3 | |  | | CSI-RS.2.1 TDD | | | | |
| reportConfigType | | | |  | | periodic | | | N/A | |
| reportQuantity | | | |  | | cri-RI-PMI-CQI | | | N/A | |
| CSI reporting | | Config 1,2 | | slot | | 5 | | | N/A | |
| periodicity | | Config 3 | |  | | 10 | | | N/A | |
| CSI reporting offset | | Config 1,2 | | slot | | 3 | | | N/A | |
|  | | Config 3 | |  | | 5 | | | N/A | |
| SMTC Configuration | | | | |  | | SMTC.1 | | | |
| SSB Configuration | | | Config 1,2 | |  | | SSB.1 FR1 | | | |
| Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2 | | kHz | | 15 | | | |
| Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | | | Config 1,2 | | kHz | | 15 | | | |
| Config 3 | | 30 | | | |
| PRACH configuration | | | | |  | | FR1 PRACH configuration 1 | | | |
| BWP configuration | | | Initial DL BWP | |  | | DLBWP.0.1 | | | |
| Dedicated DL BWP | |  | | DLBWP.1.1 | | | |
| Initial UL BWP | |  | | ULBWP.0.1 | | | |
| Dedicated UL BWP | |  | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | | | dB | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | |  | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |  | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |  | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |  | |
| EPRE ratio of PDSCH to PDSCH | | | | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |  | |
| Note2 | | | | | dBm/15kHz | | -98 | | | |
| Note2 | Config 1,2 | | | | dBm/SCS | | -98 | | | |
| Config 3 | | | | -95 | | | |
|  | | | | | dB | | 8 | -2.41 | -Infinity | 1.36 |
|  | | | | | dB | | 8 | 8 | -Infinity | 10 |
| SSB\_RP | Config 1,2 | | | | dBm/SCS | | -90 | -90 | -Infinity | -88 |
| Config 3 | | | |  | | -87 | -87 | -Infinity | -85 |
| IoNote3 | Config 1,2 | | | | dBm/  9.36MHz | | -61.41 | -57.67 | -61.41 | -57.67 |
| Config 3 | | | | dBm/  38.16MHz | | -55.31 | -51.56 | -55.31 | -51.56 |
| Propagation condition | | | | |  | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | |

Same test requirements as described in section 6.3.1.7.5 except:

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

Dhandover2= TRRC\_procedure + Tinterrupt2

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

- Tinterrupt2 = 2 slots for test configuration 6.3.1.8-1/2 and Tinterrupt2 = 3 slots for test configuration 6.3.1.8-3, is the allowed interruption length during Dhandover2 as in 38.133 [13] clause 6.1.3.2.2;

This gives a total of 10 ms + 2 slots for test configuration 6.3.1.8-1/2 and 10 ms + 3 slots for test configuration 6.3.1.8-3.

#### 6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

6.3.1.9.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.9.2 Test applicability

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

6.3.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.9.

6.3.1.9.4 Test description

6.3.1.9.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.9.4.1-1.

Table 6.3.1.9.4.1-1: NR SA FR1 Intra-band inter-frequency synchronous DAPS handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 6.3.1.9-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.9-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.9-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.9.4.1-2

Table 6.3.1.9.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. Note 1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.9.4.1-1 | | |
| 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 |
| Exceptions to connection diagram | N/A | |  |
| Note 1: For UE supporting DAPS HO on intra-band contiguous BC, the test frequencies are selected according to E.1.4.2. For UE supporting DAPS HO on intra-band non-contiguous BC, the test frequencies are selected according to E.1.4.3 | | | |

1. Message contents are defined in clause 6.3.1.9.4.3.

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

3. The test parameters are given in Table 6.3.1.9.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.9.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | | dB | -3 |  |
| 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 | |  | 0 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |
| T4 | | ms | 10 + Tinterrupt2 | Tinterrupt2­ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-6 |
| T5 | | ms | 100 |  |

6.3.1.9.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.9.4.1-3 and 6.3.1.9.5-1 respectively.

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

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

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

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. Cell 2 is continuously scheduled in DL during T4.During T4, the UE shall accomplish the release actions within Dhandover2

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

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 6.3.1.9.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-band inter-frequency carrier and periodical CSI reporting on Cell 1.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.9.5-1.

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

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.9.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

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

- Dhandover1 = 72 ms.

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

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

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

13. When T4 expires, T5 starts.

15. If

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

and

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

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

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

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

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

6.3.1.9.4.3 Message contents

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

Table 6.3.1.9.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| measConfig | MeasConfig | Table 6.3.1.9.4.3-3 |  |
| nonCriticalExtension SEQUENCE { |  |  |  |
| masterCellGroup SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.9.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.9.4.3-2: ServingCellConfig (Table 6.3.1.9.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

Table 6.3.1.9.4.3-3: MeasConfig (Table 6.3.1.9.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfig[1] CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR(-3) specified in Table H.3.1-4 | Acutal value of A3-threshold is -3 dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.9.4.3-4: MeasurementReport (Step 7)

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

Table 6.3.1.9.4.3-5: RRCReconfiguration(Step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig\_NoKeyChange | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.9.4.3-6 |  |
| nonCriticalExtension SEQUENCE{ |  |  |  |
| masterCellGroup | CellGroupConfig | Table 6.3.1.9.4.3-7 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.9.4.3-6: RadioBearerConfig (Table 6.3.1.9.4.3-5)

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

Table 6.3.1.9.4.3-7: CellGroupConfig (Table 6.3.1.9.4.3-5)

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

Table 6.3.1.9.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.9.5 Test requirements

Table 6.3.1.9.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.9.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | Cell 2 | | | |
|  | | |  | T1 | | T2-T5 | T1 | | | T2-T5 |
| NR RF Channel Number | | |  | 1 | | | 2 | | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
|  | | Config 2,3 |  | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
|  | | Config 2 |  | SR.1.1 TDD | | | | | | |
|  | | Config 3 |  | SR.2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | | | | |
|  | | Config 3 |  | CR.2.1 TDD | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| CSI-RS configuration for CSI reporting | | Config 1 |  | CSI-RS.1.1 FDD | | | | | | |
| Config 2 |  | CSI-RS.1.1 TDD | | | | | | |
| Config 3 |  | CSI-RS.2.1 TDD | | | | | | |
| reportConfigType | | |  |  | | | | periodic | | |
| reportQuantity | | |  |  | | | | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | | Config 1,2 | slot | 5 | | | | 5 | | |
| Config 3 |  | 10 | | | | 10 | | |
| CSI reporting offset | | Config 1,2 | slot | 3 | | | | 3 | | |
| Config 3 |  | 5 | | | | 5 | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | | | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | |
|  | Config 3 | | -95 | | | | | | |
|  | | | dB | 8 | 8 | | -Infinity | | 11.7 | |
|  | | | dB | 8 | 8 | | -Infinity | | 11.7 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -Infinity | | -86.3 | |
| Config 3 | | dBm/SCS | -86.99 | -86.99 | | -Infinity | | -83.29 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -61.41 | | -70.05 | | -58.06 | |
|  | Config 3 | | dBm/  38.16MHz | -55.31 | -55.31 | | -63.94 | | -51.96 | |
| 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 Dhandover1 from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

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

* TRRC\_procedure= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
* Tsearch = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
* TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.
* Tprocessing = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.
* T∆ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.
* Tmargin = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

During T3 UE is allowed to cause Tinterrupt1 interruption to cell 1. Tinterrupt1 is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause Tinterrupt2 interruption to cell 1. Tinterrupt2 is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

#### 6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

6.3.1.10.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.10.2 Test applicability

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

6.3.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.10.

6.3.1.10.4 Test description

6.3.1.10.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.10.4.1-1.

Table 6.3.1.10.4.1-1: NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 6.3.1.10-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.10.4.1-2

Table 6.3.1.10.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. Note 1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.10.4.1-1 | | |
| 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 |
| Exceptions to connection diagram | N/A | |  |
| Note 1: For UE supporting DAPS HO on intra-band contiguous BC, the test frequencies are selected according to E.1.4.2. For UE supporting DAPS HO on intra-band non-contiguous BC, the test frequencies are selected according to E.1.4.3. | | | |

1. Message contents are defined in clause 6.3.1.10.4.3.

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

3. The test parameters are given in Table 6.3.1.10.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.10.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | | dB | -3 |  |
| 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 | |  | 10 μs | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |
| T4 | | ms | 10 + Tinterrupt2 | Tinterrupt2­ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-6 |
| T5 | | ms | 100 |  |

6.3.1.10.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.10.4.1-3 and 6.3.1.10.5-1 respectively.

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

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

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

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within Dhandover2

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

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 6.3.1.10.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-band inter-frequency carrier and periodical CSI reporting on Cell 1.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.10.5-1.

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

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.10.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

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

- Dhandover1 = 72 ms.

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

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

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

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

13. When T4 expires, T5 starts.

15. If

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

and

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

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

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

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

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

6.3.1.10.4.3 Message contents

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

Table 6.3.1.10.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| measConfig | MeasConfig | Table 6.3.1.10.4.3-3 |  |
| nonCriticalExtension SEQUENCE { |  |  |  |
| masterCellGroup SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.10.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.10.4.3-2: ServingCellConfig (Table 6.3.1.10.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

Table 6.3.1.10.4.3-3: MeasConfig (Table 6.3.1.10.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfig[1] CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR(-3) specified in Table H.3.1-4 | Acutal value of A3-threshold is -3 dBm |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.10.4.3-4: MeasurementReport (Step 7)

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

Table 6.3.1.10.4.3-5: RRCReconfiguration(Step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig\_NoKeyChange | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.10.4.3-6 |  |
| nonCriticalExtension SEQUENCE{ |  |  |  |
| masterCellGroup | CellGroupConfig | Table 6.3.1.10.4.3-7 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.10.4.3-6: RadioBearerConfig (Table 6.3.1.10.4.3-5)

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

Table 6.3.1.10.4.3-7: CellGroupConfig (Table 6.3.1.10.4.3-5)

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

Table 6.3.1.10.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.10.5 Test requirements

Table 6.3.1.10.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.10.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | Cell 2 | |
|  | | |  | T1 | | T2 -T5 | |
| NR RF Channel Number | | |  | 1 | | 2 | |
| Duplex mode | | Config 1 |  | FDD | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | |
|  | | Config 3 |  | CR.2.1 TDD | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | |
| OCNG Patterns | | |  | OP.1 | | | |
| SMTC Configuration | | |  | SMTC.1 | | | |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1 | kHz | 15 kHz | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | |
| Note2 | | | dBm/15kHz | -98 | | | |
| Note2 | Config 1 | | dBm/SCS | -98 | | | |
|  | | | dB | 8 | 8 | -Infinity | 11.7 |
|  | | | dB | 8 | 8 | -Infinity | 11.7 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | -Infinity | -86.3 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -61.41 | -70.05 | -58.06 |
| 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 Dhandover1 from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

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

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

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

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

- Tprocessing = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

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

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

This gives a total of 72 ms.

During T3 UE is allowed to cause Tinterrupt1 interruption to cell 1. Tinterrupt1is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause Tinterrupt2 interruption to cell 1. Tinterrupt2 is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

#### 6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

6.3.1.11.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.11.2 Test applicability

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

6.3.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.11.

6.3.1.11.4 Test description

6.3.1.11.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.11.4.1-1.

Table 6.3.1.11.4.1-1: NR SA FR1 Inter-band inter-frequency synchronous DAPS handover test configurations

| **Config** | **Description** |
| --- | --- |
| 6.3.1.11-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.11-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.11-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.11-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-5 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-6 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-7 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-8 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-9 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.11.4.1-2

Table 6.3.1.11.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.11.4.1-1 | | |
| 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 6.3.1.11.4.3.

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

3. The test parameters are given in Table 6.3.1.11.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.11.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 | PCell on RF channel number 1 |
|  | Neighbouring cell |  | Cell 2 | Neighbour cell on RF channel number 2 |
| Final condition | Active cell |  | Cell 2 | PCell on RF channel number 2 |
|  | Neighbouring cell |  | Cell 1 | Neighbour cell on RF channel number 1 |
| A3-Offset | Config 1,2,4,5,9 | dB | -7 (Note 1) |  |
| Config 3,6 | dB | -10 (Note 1) |
| Config 7,8 | dB | -4 |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | μs | 33 | Synchronous cells |
| DRX | |  | OFF |  |
| Measurement gap pattern Id | |  | #0 | Gaps are configured before T2. |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for synchronous DAPS HO |
| T5 | | ms | 100 |  |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | |

6.3.1.11.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.11.4.1-3, 6.3.1.11.5-1 and 6.3.1.11.5-2 respectively.

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

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

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

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within Dhandover2

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

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 6.3.1.11.5-1 and Table 6.3.1.11.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the inter-band inter-frequency carrier and periodical CSI reporting on Cell 1.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2.

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

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

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

- Dhandover1 = 72 ms.

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

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

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

13. When T4 expires, T5 starts.

15. If

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

and

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

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

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

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

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

6.3.1.11.4.3 Message contents

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

Table 6.3.1.11.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| measConfig | MeasConfig | Table 6.3.1.11.4.3-3 |  |
| nonCriticalExtension SEQUENCE { |  |  |  |
| masterCellGroup SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.11.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.11.4.3-2: ServingCellConfig (Table 6.3.1.11.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

Table 6.3.1.11.4.3-3: MeasConfig (Table 6.3.1.11.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfig[1] CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR(-7) specified in Table H.3.1-4 | Acutal value of a3-Offset is -7 dB | 6.3.1.11-1,  6.3.1.11-2,  6.3.1.11-4,  6.3.1.11-5,  6.3.1.11-9. |
|  | ReportConfigNR(-10) specified in Table H.3.1-4 | Acutal value of a3-Offset is -10 dB | 6.3.1.11-3, 6.3.1.11-6 |
|  | ReportConfigNR(-4) specified in Table H.3.1-4 | Acutal value of a3-Offset is -4 dB | 6.3.1.11-7,  6.3.1.11-8 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.11.4.3-4: MeasurementReport (Step 7)

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

Table 6.3.1.11.4.3-5: RRCReconfiguration(Step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig\_NoKeyChange | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.11.4.3-6 |  |
| nonCriticalExtension SEQUENCE{ |  |  |  |
| masterCellGroup | CellGroupConfig | Table 6.3.1.11.4.3-7 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.11.4.3-6: RadioBearerConfig (Table 6.3.1.11.4.3-5)

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

Table 6.3.1.11.4.3-7: CellGroupConfig (Table 6.3.1.11.4.3-5)

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

Table 6.3.1.11.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.11.5 Test requirements

Table 6.3.1.11.5-1, Table 6.3.1.11.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.11.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 1)

| **Parameter** | | | | | **Unit** | **Cell 1** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | |  | **T1** | **T2 – T5** |
| NR RF Channel Number | | | | |  | 1 | |
| Duplex mode | | Config 1,4,7 | | |  | FDD | |
|  | | Config 2,3,5,6,8,9 | | |  | TDD | |
| TDD configuration | | Config 1,4,7 | | |  | Not Applicable | |
|  | | Config 2,5,8 | | |  | TDDConf.1.1 | |
|  | | Config 3,6,9 | | |  | TDDConf.2.1 | |
| BWchannel | | Config 1,4,7 | | | MHz | 10: NRB,c = 52 | |
|  | | Config 2,5,8 | | |  | 10: NRB,c = 52 | |
|  | | Config 3,6,9 | | |  | 40: NRB,c = 106 | |
| BWP BW | | Config 1,4,7 | | | MHz | 10: NRB,c = 52 | |
|  | | Config 2,5,8 | | |  | 10: NRB,c = 52 | |
|  | | Config 3,6,9 | | |  | 40: NRB,c = 106 | |
| TRS configuration | | Config 1,4,7 | | |  | TRS.1.1 FDD | |
|  | | Config 2,5,8 | | |  | TRS.1.1 TDD | |
|  | | Config 3,6,9 | | |  | TRS.1.2 TDD | |
| DRX Cycle | | | | | ms | Not Applicable | |
| PDSCH Reference | | Config 1,4,7 | | |  | SR.1.1 FDD | |
| measurement channel | | Config 2,5,8 | | |  | SR.1.1 TDD | |
|  | | Config 3,6,9 | | |  | SR.2.1 TDD | |
| CORESET Reference | | Config 1,4,7 | | |  | CR.1.1 FDD | |
| Channel | | Config 2,5,8 | | |  | CR.1.1 TDD | |
|  | | Config 3,6,9 | | |  | CR.2.1 TDD | |
| OCNG Patterns | | | | |  | OP.1 | |
| CSI-RS configuration | | | Config 1,4,7 | |  | CSI-RS.1.1 FDD | |
| for CSI reporting | | | Config 2,5,8 | |  | CSI-RS.1.1 TDD | |
|  | | | Config 3,6,9 | |  | CSI-RS.2.1 TDD | |
| reportConfigType | | | | |  | periodic | |
| reportQuantity | | | | |  | cri-RI-PMI-CQI | |
| CSI reporting | Config 1,2,4,5,7,8 | | | | slot | 5 | |
| periodicity | Config 3,6,9 | | | |  | 10 | |
| CSI reporting offset | Config 1,2,4,5,7,8 | | | | slot | 3 | |
|  | Config 3,6,9 | | | |  | 5 | |
| SMTC Configuration | | | | |  | SMTC.1 | |
| SSB Configuration | | Config 1,2,4,5,7,8 | | |  | SSB.1 FR1 | |
| Config 3,6,9 | | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5,7,8 | | | kHz | 15 kHz | |
| Config 3,6,9 | | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5,7,8 | | | kHz | 15 kHz | |
| Config 3,6,9 | | | 30 kHz | |
| PRACH configuration | | | | |  | FR1 PRACH configuration 2 | |
| BWP | | Initial DL BWP | | |  | DLBWP.0.1 | |
|  | | Dedicated DL BWP | | |  | DLBWP.1.3 | |
|  | | Initial UL BWP | | |  | ULBWP.0.1 | |
|  | | Dedicated UL BWP | | |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |  |  | |
| Note2 | | | | | dBm/15kHz | -98 | -98 |
| Note2 | | | | Config 1,2,4,5,7,8 | dBm/SCS | -98 | -98 |
|  | | | | Config 3,6,9 |  | -95 | -95 |
|  | | | | | dB | 4 | 4 |
|  | | | | | dB | 4 | 4 |
| SSB\_RP | | | | Config 1,2,4,5,7,8 | dBm/SCS | -94 | -94 |
|  | | | | Config 3,6,9 | dBm/SCS | -91 | -91 |
| IoNote3 | | | | Config 1,2,4,5,7,8 | dBm/  9.36MHz | -64.59 | -64.59 |
|  | | | | Config 3,6,9 | dBm/  38.16MHz | -58.49 | -58.49 |
| Propagation condition | | | | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

Table 6.3.1.11.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 2)

| Parameter | | | | Unit | Cell 2 | |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | |  | T1 | T2 - T5 |
| NR RF Channel Number | | | |  | 2 | |
| Duplex mode | Config 1,2,3 | | |  | FDD | |
|  | Config 4,5,6,7,8,9 | | |  | TDD | |
| TDD configuration | Config 1,2,3 | | |  | Not Applicable | |
|  | Config 4,5,6 | | |  | TDDConf.1.1 | |
|  | Config 7,8,9 | | |  | TDDConf.2.1 | |
| BWchannel | Config 1,2,3 | | | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 | | |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 | | |  | 40: NRB,c = 106 | |
| BWP BW | Config 1,2,3 | | | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 | | |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 | | |  | 40: NRB,c = 106 | |
| TRS configuration | Config 1,2,3 | | |  | TRS.1.1 FDD | |
|  | Config 4,5,6 | | |  | TRS.1.1 TDD | |
|  | Config 7,8,9 | | |  | TRS.1.2 TDD | |
| DRx Cycle | | | | ms | Not Applicable | |
| PDSCH Reference | Config 1,2,3 | | |  | SR.1.1 FDD | |
| measurement channel | Config 4,5,6 | | |  | SR.1.1 TDD | |
|  | Config 7,8,9 | | |  | SR2.1 TDD | |
| CORESET Reference | Config 1,2,3 | | |  | CR.1.1 FDD | |
| Channel | Config 4,5,6 | | |  | CR.1.1 TDD | |
|  | Config 7,8,9 | | |  | CR2.1 TDD | |
| OCNG Patterns | | | |  | OCNG pattern 1 | |
| CSI-RS configuration | | Config 1,4,7 | |  | CSI-RS.1.1 FDD | |
| for CSI reporting | | Config 2,5,8 | |  | CSI-RS.1.1 TDD | |
|  | | Config 3,6,9 | |  | CSI-RS.2.1 TDD | |
| SMTC Configuration | | | |  | SMTC pattern 1 | |
| SSB Configuration | Config 1,2,3,4,5,6 | | |  | SSB.1 FR1 | |
| Config 7,8,9 | | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3,4,5,6 | | | kHz | 15 kHz | |
| Config 7,8,9 | | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3,4,5,6 | | | kHz | 15 kHz | |
| Config 7,8,9 | | | 30 kHz | |
| PRACH configuration | | | |  | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP | | |  | DLBWP.0.1 | |
|  | Dedicated DL BWP | | |  | DLBWP.1.3 | |
|  | Initial UL BWP | | |  | ULBWP.0.1 | |
|  | Dedicated UL BWP | | |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |  |  | |
| Note2 | | | | dBm/15kHz | -98 | -98 |
| Note2 | | | Config 1,2,3,4,5,6 | dBm/SCS | -98 | -98 |
|  | | | Config 7,8,9 |  | -95 | -95 |
|  | | | | dB | -Infinity | 4 |
|  | | | | dB | -Infinity | 4 |
| SSB\_RP | | | Config 1,2,3,4,5,6 | dBm/SCS | -Infinity | -94 |
|  | | | Config 7,8,9 | dBm/SCS | -Infinity | -91 |
| IoNote3 | | | Config 1,2,3,4,5,6 | dBm/  9.36MHz | -70.05 | -64.59 |
|  | | | Config 7,8,9 | dBm/  38.16MHz | -63.94 | -58.49 |
| Propagation condition | | | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than Dhandover1 from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

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

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

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

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

- Tprocessing = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

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

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

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than Dhandover2 from the beginning of time period T4. During Dhandover2, the interruptionon Cell 2 shall not exceed Tinterrupt2 as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for synchronous DAPS HO.

The handover delay Dhandover2 can be expressed as: TRRC\_procedure + Tinterrupt2, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [13].

#### 6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

6.3.1.12.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.12.2 Test applicability

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

6.3.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.12.

6.3.1.12.4 Test description

6.3.1.12.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.1.12.4.1-1.

Table 6.3.1.12.4.1-1: NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover test configurations

| **Config** | **Description** |
| --- | --- |
| 6.3.1.12-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.12-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.12-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.12-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-5 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-6 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-7 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-8 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-9 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.12.4.1-2

Table 6.3.1.12.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.12.4.1-1 | | |
| 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 6.3.1.12.4.3.

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

3. The test parameters are given in Table 6.3.1.12.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.12.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | Config 1,2,4,5,9 | dB | -7(Note 1) |  |
|  | Config 3,6 | dB | -10(Note 1) |  |
|  | Config 7,8 | dB | -4 |  |
| 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 | Config 1,2,4,5 | ms | 0.5 | Asynchronous cells |
|  | Config3,6,7,8,9 | ms | 0.25 |
| DRX | |  | OFF |  |
| Measurement gap pattern Id | |  | #0 | Gaps are configured before T2. |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for asynchronous DAPS HO. |
| T5 | | ms | 100 |  |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | |

6.3.1.12.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.12.4.1-3, 6.3.1.12.5-1 and 6.3.1.12.5-2 respectively.

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

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

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

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within Dhandover2

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

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 6.3.1.12.5-1 and Table 6.3.1.12.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the inter-band inter-frequency carrier and periodical CSI reporting on Cell 1.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2.

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

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

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

- Dhandover1 = 72 ms.

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

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

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

13. When T4 expires, T5 starts.

15. If

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

and

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

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

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

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

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

6.3.1.12.4.3 Message contents

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

Table 6.3.1.12.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR\_MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| measConfig | MeasConfig | Table 6.3.1.12.4.3-3 |  |
| nonCriticalExtension SEQUENCE { |  |  |  |
| masterCellGroup SEQUENCE { |  |  |  |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.12.4.3-2 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.12.4.3-2: ServingCellConfig (Table 6.3.1.12.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 |  |  |
| } |  |  |  |

Table 6.3.1.12.4.3-3: MeasConfig (Table 6.3.1.12.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { |  |  |  |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfig[1] CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR(-7) specified in Table H.3.1-4 | Acutal value of a3-Offset is -7 dB | 6.3.1.11-1,  6.3.1.11-2,  6.3.1.11-4,  6.3.1.11-5,  6.3.1.11-9. |
|  | ReportConfigNR(-10) specified in Table H.3.1-4 | Acutal value of a3-Offset is -10 dB | 6.3.1.11-3, 6.3.1.11-6 |
|  | ReportConfigNR(-4) specified in Table H.3.1-4 | Acutal value of a3-Offset is -4 dB | 6.3.1.11-7,  6.3.1.11-8 |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.12.4.3-4: MeasurementReport (Step 7)

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

Table 6.3.1.12.4.3-5: RRCReconfiguration(Step 8)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig\_NoKeyChange | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| rrcReconfiguration SEQUENCE { |  |  |  |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.12.4.3-6 |  |
| nonCriticalExtension SEQUENCE{ |  |  |  |
| masterCellGroup | CellGroupConfig | Table 6.3.1.12.4.3-7 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.1.12.4.3-6: RadioBearerConfig (Table 6.3.1.12.4.3-5)

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

Table 6.3.1.12.4.3-7: CellGroupConfig (Table 6.3.1.12.4.3-5)

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

Table 6.3.1.12.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.12.5 Test requirements

Table 6.3.1.12.5-1, Table 6.3.1.12.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.12.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 1)

| **Parameter** | | | | | **Unit** | **Cell 1** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | |  | **T1** | **T2 – T5** |
| NR RF Channel Number | | | | |  | 1 | |
| Duplex mode | | Config 1,4,7 | | |  | FDD | |
|  | | Config 2,3,5,6,8,9 | | |  | TDD | |
| TDD configuration | | Config 1,4,7 | | |  | Not Applicable | |
|  | | Config 2,5,8 | | |  | TDDConf.1.1 | |
|  | | Config 3,6,9 | | |  | TDDConf.2.1 | |
| BWchannel | | Config 1,4,7 | | | MHz | 10: NRB,c = 52 | |
|  | | Config 2,5,8 | | |  | 10: NRB,c = 52 | |
|  | | Config 3,6,9 | | |  | 40: NRB,c = 106 | |
| BWP BW | | Config 1,4,7 | | | MHz | 10: NRB,c = 52 | |
|  | | Config 2,5,8 | | |  | 10: NRB,c = 52 | |
|  | | Config 3,6,9 | | |  | 40: NRB,c = 106 | |
| TRS configuration | | Config 1,4,7 | | |  | TRS.1.1 FDD | |
|  | | Config 2,5,8 | | |  | TRS.1.1 TDD | |
|  | | Config 3,6,9 | | |  | TRS.1.2 TDD | |
| DRX Cycle | | | | | ms | Not Applicable | |
| PDSCH Reference | | Config 1,4,7 | | |  | SR.1.1 FDD | |
| measurement channel | | Config 2,5,8 | | |  | SR.1.1 TDD | |
|  | | Config 3,6,9 | | |  | SR.2.1 TDD | |
| CORESET Reference | | Config 1,4,7 | | |  | CR.1.1 FDD | |
| Channel | | Config 2,5,8 | | |  | CR.1.1 TDD | |
|  | | Config 3,6,9 | | |  | CR.2.1 TDD | |
| OCNG Patterns | | | | |  | OP.1 | |
| CSI-RS configuration | | | Config 1,4,7 | |  | CSI-RS.1.1 FDD | |
| for CSI reporting | | | Config 2,5,8 | |  | CSI-RS.1.1 TDD | |
|  | | | Config 3,6,9 | |  | CSI-RS.2.1 TDD | |
| reportConfigType | | | | |  | periodic | |
| reportQuantity | | | | |  | cri-RI-PMI-CQI | |
| CSI reporting | Config 1,2,4,5,7,8 | | | | slot | 5 | |
| periodicity | Config 3,6,9 | | | |  | 10 | |
| CSI reporting offset | Config 1,2,4,5,7,8 | | | | slot | 3 | |
|  | Config 3,6,9 | | | |  | 5 | |
| SMTC Configuration | | | | |  | SMTC.1 | |
| SSB Configuration | | Config 1,2,4,5,7,8 | | |  | SSB.1 FR1 | |
| Config 3,6,9 | | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5,7,8 | | | kHz | 15 kHz | |
| Config 3,6,9 | | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5,7,8 | | | kHz | 15 kHz | |
| Config 3,6,9 | | | 30 kHz | |
| PRACH configuration | | | | |  | FR1 PRACH configuration 2 | |
| BWP | | Initial DL BWP | | |  | DLBWP.0.1 | |
|  | | Dedicated DL BWP | | |  | DLBWP.1.3 | |
|  | | Initial UL BWP | | |  | ULBWP.0.1 | |
|  | | Dedicated UL BWP | | |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |  |  | |
| Note2 | | | | | dBm/15kHz | -98 | -98 |
| Note2 | | | | Config 1,2,4,5,7,8 | dBm/SCS | -98 | -98 |
|  | | | | Config 3,6,9 |  | -95 | -95 |
|  | | | | | dB | 4 | 4 |
|  | | | | | dB | 4 | 4 |
| SSB\_RP | | | | Config 1,2,4,5,7,8 | dBm/SCS | -94 | -94 |
|  | | | | Config 3,6,9 | dBm/SCS | -91 | -91 |
| IoNote3 | | | | Config 1,2,4,5,7,8 | dBm/  9.36MHz | -64.59 | -64.59 |
|  | | | | Config 3,6,9 | dBm/  38.16MHz | -58.49 | -58.49 |
| Propagation condition | | | | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

Table 6.3.1.12.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 2)

| Parameter | | | | Unit | Cell 2 | |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | |  | T1 | T2 - T5 |
| NR RF Channel Number | | | |  | 2 | |
| Duplex mode | Config 1,2,3 | | |  | FDD | |
|  | Config 4,5,6,7,8,9 | | |  | TDD | |
| TDD configuration | Config 1,2,3 | | |  | Not Applicable | |
|  | Config 4,5,6 | | |  | TDDConf.1.1 | |
|  | Config 7,8,9 | | |  | TDDConf.2.1 | |
| BWchannel | Config 1,2,3 | | | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 | | |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 | | |  | 40: NRB,c = 106 | |
| BWP BW | Config 1,2,3 | | | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 | | |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 | | |  | 40: NRB,c = 106 | |
| TRS configuration | Config 1,2,3 | | |  | TRS.1.1 FDD | |
|  | Config 4,5,6 | | |  | TRS.1.1 TDD | |
|  | Config 7,8,9 | | |  | TRS.1.2 TDD | |
| DRx Cycle | | | | ms | Not Applicable | |
| PDSCH Reference | Config 1,2,3 | | |  | SR.1.1 FDD | |
| measurement channel | Config 4,5,6 | | |  | SR.1.1 TDD | |
|  | Config 7,8,9 | | |  | SR2.1 TDD | |
| CORESET Reference | Config 1,2,3 | | |  | CR.1.1 FDD | |
| Channel | Config 4,5,6 | | |  | CR.1.1 TDD | |
|  | Config 7,8,9 | | |  | CR2.1 TDD | |
| OCNG Patterns | | | |  | OCNG pattern 1 | |
| CSI-RS configuration | | Config 1,4,7 | |  | CSI-RS.1.1 FDD | |
| for CSI reporting | | Config 2,5,8 | |  | CSI-RS.1.1 TDD | |
|  | | Config 3,6,9 | |  | CSI-RS.2.1 TDD | |
| SMTC Configuration | | | |  | SMTC pattern 1 | |
| SSB Configuration | Config 1,2,3,4,5,6 | | |  | SSB.1 FR1 | |
| Config 7,8,9 | | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3,4,5,6 | | | kHz | 15 kHz | |
| Config 7,8,9 | | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3,4,5,6 | | | kHz | 15 kHz | |
| Config 7,8,9 | | | 30 kHz | |
| PRACH configuration | | | |  | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP | | |  | DLBWP.0.1 | |
|  | Dedicated DL BWP | | |  | DLBWP.1.3 | |
|  | Initial UL BWP | | |  | ULBWP.0.1 | |
|  | Dedicated UL BWP | | |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |  |  | |
| Note2 | | | | dBm/15kHz | -98 | -98 |
| Note2 | | | Config 1,2,3,4,5,6 | dBm/SCS | -98 | -98 |
|  | | | Config 7,8,9 |  | -95 | -95 |
|  | | | | dB | -Infinity | 4 |
|  | | | | dB | -Infinity | 4 |
| SSB\_RP | | | Config 1,2,3,4,5,6 | dBm/SCS | -Infinity | -94 |
|  | | | Config 7,8,9 | dBm/SCS | -Infinity | -91 |
| IoNote3 | | | Config 1,2,3,4,5,6 | dBm/  9.36MHz | -70.05 | -64.59 |
|  | | | Config 7,8,9 | dBm/  38.16MHz | -63.94 | -58.49 |
| Propagation condition | | | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than Dhandover1 from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

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

* TRRC\_procedure= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
* Tsearch = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2.
* TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.
* Tprocessing = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.
* T∆ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.
* Tmargin = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than Dhandover2 from the beginning of time period T4. During Dhandover2, the interruptionon Cell 2 shall not exceed Tinterrupt2 as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for asynchronous DAPS HO.

The handover delay Dhandover2 can be expressed as: TRRC\_procedure + Tinterrupt2, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [13].

### 6.3.2 RRC connection mobility control

#### 6.3.2.1 RRC re-establishment

##### 6.3.2.1.0 Minimum conformance requirements

6.3.2.1.0.1 Minimum conformance requirements for FR1 RRC re-establishment

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 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay (TUE\_re-establish\_delay) requirement shall be less than:

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

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

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

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

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

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

Tidentify\_intra\_NR: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then Tidentify\_intra\_NR=0; otherwise Tidentify\_intra\_NR shall not exceed the values defined in table 6.3.2.1.0.1-1.

Tidentify\_inter\_NR,i: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. Tidentify\_inter\_NR,i shall not exceed the values defined in table 6.3.2.1.0.1-2.

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

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

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

TPRACH: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. TPRACH can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

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

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

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.

Table 6.3.2.1.0.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

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

Table 6.3.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

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

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1.2.1.

##### 6.3.2.1.1 NR SA FR1 RRC re-establishment

6.3.2.1.1.1 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.

6.3.2.1.1.2 Test applicability

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

6.3.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.1.

6.3.2.1.1.4 Test description

6.3.2.1.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.1.4.1-1

Table 6.3.2.1.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 6.3.2.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.1.4.1-2

Table 6.3.2.1.1.4.1-2: Initial conditions for NR Intra-frequency RRC Re-establishment in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.1.1.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 6.3.2.1.1.4.1-3.

2. Message contents are defined in clause 6.3.2.1.1.4.3.

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

Table 6.3.2.1.1.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer |
| T311 | | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | OFF |  |
| PRACH configuration | |  | 1, 2, 3 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3 | 5 |  |
| T2 | | ms | 1, 2, 3 | 240 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3 | | s | 1, 2, 3 | 2 |  |

6.3.2.1.1.4.2 Test procedure

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

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 6.3.2.1.1.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.1.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.1.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1.6 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

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

6.3.2.1.1.4.3 Message contents

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

Table 6.3.2.1.1.4.3-1: Common Exception messages intra-frequency RRC re-establishment

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-1 | 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 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-2 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-3 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 6.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

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

Table 6.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { |  |  |  |
| reportConfigToAddModList | Not present |  |  |
| measIdToAddModList | Not present |  |  |
| quantityConfig | Not present |  |  |
| } |  |  |  |

6.3.2.1.1.5 Test requirement

Table 6.3.2.1.1.5-1 defines the primary level settings including test tolerances for NR Intra-frequency RRC Re-establishment in FR1 test case.

Table 6.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

| Parameter | Unit | Test configuration | Cell 1 | | | | | Cell 2 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | | T2 | | T3 | T1 | T2 | | T3 |
| TDD configuration |  | 1 | N/A | | | | | N/A | | | |
| 2 | TDDConf.1.1 | | | | | TDDConf.1.1 | | | |
| 3 | TDDConf.2.1 | | | | | TDDConf.2.1 | | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | | | SR.1.1 FDD | | | |
| 2 | SR.1.1 TDD | | | | | SR.1.1 FDD | | | |
| 3 | SR.2.1 TDD | | | | | SR.2.1 FDD | | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | | | CR.1.1 FDD | | | |
| 2 | CR.1.1 TDD | | | | | CR.1.1 TDD | | | |
| 3 | CR.2.1 TDD | | | | | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | | | CCR.1.1 FDD | | | |
| 2 | CCR.1.1 TDD | | | | | CCR.1.1 TDD | | | |
| 3 | CCR.2.1 TDD | | | | | CCR.2.1 TDD | | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | | | OP.1 defined in A.3.2.1 | | | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | | | | TRS.1.1 FDD | | | |
| 2 | TRS.1.1 TDD | | | | | TRS.1.1 TDD | | | |
| 3 | TRS.1.2 TDD | | | | | TRS.1.2 TDD | | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | | | ULBWP.0.1 | | | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | N/A | | N/A | | N/A | N/A | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | N/A | | N/A | | N/A | N/A | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3 | SSB | | | | | SSB | | | |
|  | dB | 1 | 1.54 | | -infinity | | -infinity | -3.79 | 4 | | 4 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | | | | | | |
| 2 | -98 | | | | | | | | |
| 3 | -95 | | | | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | | | | |
| 2 |
| 3 |
|  | dB | 1 | 7 | | -infinity | | -infinity | 4 | 4 | | 4 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -91 | | -infinity | | -infinity | -94 | -94 | | -94 |
| 2 | -91 | | -infinity | | -infinity | -94 | -94 | | -94 |
| 3 | -88 | | -infinity | | -infinity | -91 | -91 | | -91 |
| Io | dBm/9.36 MHz | 1 | -60.74 | | -64.59 | | -64.59 | -60.74 | -64.59 | | -64.59 |
| dBm/9.36 MHz | 2 | -60.74 | | -64.59 | | -64.59 | -60.74 | -64.59 | | -64.59 |
| dBm/38.16 MHz | 3 | -54.65 | | -58.50 | | -58.50 | -54.65 | -58.50 | | -58.50 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms, allow 1.6 s in the test case.

##### 6.3.2.1.2 NR SA FR1 - FR1 RRC re-establishment

6.3.2.1.2.1 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.

6.3.2.1.2.2 Test applicability

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

6.3.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.1.2.

6.3.2.1.2.4 Test description

6.3.2.1.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.2.4.1-1

Table 6.3.2.1.2.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 6.3.2.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.2.4.1-2

Table 6.3.2.1.2.4.1-2: Initial conditions for NR Inter-frequency RRC Re-establishment in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.1.2.4.1-1. | | |
| 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 | Without LTE link  - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 6.3.2.1.2.4.1-3.

2. Message contents are defined in clause 6.3.2.1.2.4.3.

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

Table 6.3.2.1.2.4.1-3: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer |
| T311 | | ms | 1, 2, 3 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | OFF |  |
| PRACH configuration | |  | 1, 2, 3 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3 | 5 |  |
| T2 | | ms | 1, 2, 3 | 240 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3 | | s | 1, 2, 3 | 5 |  |

6.3.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

1. Ensure the UE is in 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 6.3.2.1.2.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

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

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

6.3.2.1.2.4.3 Message contents

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

Table 6.3.2.1.2.4.3-1: Common Exception messages inter-frequency RRC re-establishment

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-1 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-2 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-3 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1 and Synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 6.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for inter-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms0 |  |  |
| t311 | ms5000 |  |  |
| } |  |  |  |

Table 6.3.2.1.2.4.3-3: *MeasConfig* for inter-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { |  |  |  |
| reportConfigToAddModList | Not present |  |  |
| measIdToAddModList | Not present |  |  |
| quantityConfig | Not present |  |  |
| } |  |  |  |

6.3.2.1.2.5 Test requirement

Table 6.3.2.1.2.5-1 defines the primary level settings including test tolerances for NR Inter-frequency RRC Re-establishment in FR1 test case.

Table 6.3.2.1.2.5-1: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1

| Parameter | Unit | Test configuration | Cell 1 | | | | | Cell 2 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | | T2 | | T3 | T1 | | T2 | T3 |
| RF Channel Number |  | 1, 2, 3 | 1 | | | | | 2 | | | |
| TDD configuration |  | 1 | N/A | | | | | N/A | | | |
| 2 | TDDConf.1.1 | | | | | TDDConf.1.1 | | | |
| 3 | TDDConf.2.1 | | | | | TDDConf.2.1 | | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | | | SR.1.1 FDD | | | |
| 2 | SR.1.1 TDD | | | | | SR.1.1 TDD | | | |
| 3 | SR.2.1 TDD | | | | | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | | | CR.1.1 FDD | | | |
| 2 | CR.1.1 TDD | | | | | CR.1.1 TDD | | | |
| 3 | CR.2.1 TDD | | | | | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | | | CCR.1.1 FDD | | | |
| 2 | CCR.1.1 TDD | | | | | CCR.1.1 TDD | | | |
| 3 | CCR.2.1 TDD | | | | | CCR.2.1 TDD | | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | | | OP.1 defined in A.3.2.1 | | | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | | | | TRS.1.1 FDD | | | |
| 2 | TRS.1.1 TDD | | | | | TRS.1.1 TDD | | | |
| 3 | TRS.1.2 TDD | | | | | TRS.1.2 TDD | | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | | | ULBWP.0.1 | | | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | N/A | | N/A | | N/A | N/A | | DLBWP.1.1 |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | N/A | | N/A | | N/A | N/A | | ULBWP.1.1 |
| RLM-RS |  | 1, 2, 3 | SSB | | | | | SSB | | | |
|  | dB | 1 | 4 | | -infinity | | -infinity | -infinity | | -infinity | 7 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | | | | | | |
| 2 | -98 | | | | | | | | |
| 3 | -95 | | | | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | | -infinity | | -infinity | -infinity | | -infinity | 7 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -94 | | -infinity | | -infinity | -infinity | | -infinity | -91 |
| 2 | -94 | | -infinity | | -infinity | -infinity | | -infinity | -91 |
| 3 | -91 | | -infinity | | -infinity | -infinity | | -infinity | -88 |
| Io | dBm/9.36 MHz | 1 | -64.59 | | -70.05 | | -70.05 | -70.05 | | -70.05 | -62.26 |
| dBm/9.36 MHz | 2 | -64.59 | | -70.05 | | -70.05 | -70.05 | | -70.05 | -62.26 |
| dBm/38.16 MHz | 3 | -58.50 | | -63.94 | | -63.94 | -63.94 | | -63.94 | -56.15 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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; it is the time required for receiving all the relevant system information as defined in TS 38.331 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.

##### 6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing

6.3.2.1.3.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits and to verify the requirements in TS 38.133 [6] clause 6.2.1

6.3.2.1.3.2 Test applicability

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

6.3.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.3.

6.3.2.1.3.4 Test description

6.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 6.3.2.1.3.4.1-1

Table 6.3.2.1.3.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 6.3.2.1.3-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.1.3-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.1.3-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.3.4.1-2

Table 6.3.2.1.3.4.1-2: Initial conditions for NR SA FR1 RRC re-establishment without serving cell timing

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.1.3.4.1-1. | | |
| 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 | - Without LTE link  - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |  |

1. The general test parameter settings are set up according to Table 6.3.2.1.3.4.1-3.

2. Message contents are defined in clause 6.3.2.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.3.2.1.3.4.1-3: General test parameters for NR SA FR1 RRC re-establishment without serving cell timing

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | OFF |  |
| PRACH configuration | |  | 1, 2, 3 | PRACH.1 FR1 |  |
| T1 | | s | 1, 2, 3 | 5 |  |
| T2 | | s | 1, 2, 3 | 6.24 | Time for the UE to detect RLF  (Summation of TEvaluate\_out\_SSB defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6] ) |
| T3 | | s | 1, 2, 3 | 3 |  |

6.3.2.1.3.4.2 Test procedure

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

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 6.3.2.1.3.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.3.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.3.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 2.2 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, switch off the UE. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

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

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

6.3.2.1.3.4.3 Message contents

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

Table 6.3.2.1.3.4.3-1: Common Exception messages for NR SA FR1 RRC re-establishment without serving cell timing

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |
| Specific message contents exceptions for Test Configuration 6.3.2.1.3-1 | 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 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.3-2 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.3-3 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells  Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

Table 6.3.2.1.3.4.3-2: *RLF-TimersAndConstants for intra-frequency RRC re-establishment*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
| Information Element | Value/remark | Comment | Condition |
| RLF-TimersAndConstants ::= SEQUENCE { |  |  |  |
| t310 | ms6000 |  |  |
| t311 | ms3000 |  |  |
| } |  |  |  |

Table 6.3.2.1.3.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { |  |  |  |
| reportConfigToAddModList | Not present |  |  |
| measIdToAddModList | Not present |  |  |
| quantityConfig | Not present |  |  |
| } |  |  |  |

6.3.2.1.3.5 Test requirement

Table 6.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 RRC re-establishment without serving cell timing test case.

Table 6.3.2.1.3.5-1: Cell specific test parameters for NR SA FR1 RRC re-establishment without serving cell timing

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1 | N/A | | | N/A | | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 | | | OP.1 | | |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | |
|  | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
| 2 | -98 | | | | | |
| 3 | -95 | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| 2 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| 3 | -91 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -64.59 |
| dBm/9.36 MHz | 2 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -64.59 |
| dBm/38.16 MHz | 3 | -58.50 | -63.94 | -63.94 | -63.94 | -63.94 | -58.50 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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 intra frequency cell without serving cell timing shall be less than 2.2 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 = 800 ms

TSI = 1280 ms; 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 2145 ms, allow 2.2 s in the test case.

#### 6.3.2.2 Random access

##### 6.3.2.2.0 Minimum conformance requirements

6.3.2.2.0.1 Minimum conformance requirements for Contention based random access

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

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

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

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

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

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

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

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

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

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

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

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

6.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

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

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

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

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

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

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

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

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

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

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

##### 6.3.2.2.1 NR SA FR1 contention based random access

6.3.2.2.1.1 Test purpose

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

6.3.2.2.1.2 Test applicability

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

6.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.1.

6.3.2.2.1.4 Test description

6.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.1.4.1-1.

Table 6.3.2.2.1.4.1-1: Contention based random access test in FR1 for NR standalone supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 6.3.2.2.1-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.1-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.1.4.1-2.

Table 6.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.2.1.4.1-1. | | |
| 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 6.3.2.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

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

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

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

5.1. Repeat steps 1-3.

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

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

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

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

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

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

6.1. Repeat steps 1-3.

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

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

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

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

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

7.1. Repeat steps 1-3.

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

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

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

7.5. The UE shall re-transmit the msg3.

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

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

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

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

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

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

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

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

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

10.1. Repeat steps 1-3.

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

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

10.4. The System Simulator shall not send a response.

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

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

6.3.2.2.1.4.3 Message contents

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

Table 6.3.2.2.1.4.3-0: Common Exception messages

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

Table 6.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
| Information Element | Value/remark | Comment | Condition |
| FrequencyInfoUL-SIB SEQUENCE { |  |  |  |
| p-Max | 23 | 23 dBm |  |
| } |  |  |  |

Table 6.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access

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

Table 6.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access

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

Table 6.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| ssb-PositionsInBurst SEQUENCE { |  |  |  |
| inOneGroup | '1100 0000'B |  |  |
| } |  |  |  |
| ss-PBCH-BlockPower | -5 |  |  |
| } |  |  |  |

6.3.2.2.1.5 Test requirement

Table 6.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.1.5-2, 6.3.2.2.1.5-3 and 6.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.1.5-1: General test parameters for contention based random access test in FR1 for NR Standalone

| Parameter | | | Unit | Test-1 | Comments |
| --- | --- | --- | --- | --- | --- |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Config 2 | SSB.2 FR1 |
| Number of SSBs per SS-burst | | |  | 2 | Different from the definition in A.3.1 |
| SS/PBCH block index | | |  | 0,1 | Different from the definition in A.3.1 |
| Duplex Mode for Cell 1 | | Config 1 |  | FDD |  |
| Config 2 | TDD |
| TDD Configuration | | Config 2 |  | TDDConf.2.1 |  |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.2 TDD |  |
| OCNG Pattern Note 1 | | |  | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 |  | SR.1.1 FDD | As defined in A.1.1 |
| Config 2 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.2.1 TDD |  |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | 3 |
| SS-RSRP | Config 1 | dBm/15kHz | -95 |
| Config 2 | -98 |
| SS-RSRP | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | -17 |
| SS-RSRP | Config 1 | dBm/15kHz | -115 |
| Config 2 | -118 |
| SS-RSRP | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 2 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | |  | FR1 PRACH configuration 1 | As defined in A. 7.1. |
| Propagation Condition | | | - | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void.  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting Random Access Preamble

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

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

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

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

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

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

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

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

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Table 6.3.2.2.1.5-2 Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 19.1 dB |

Table 6.3.2.2.1.5-3 Relative power tolerance Test requirements

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

Table 6.3.2.2.1.5-4: Te Timing error Test requirements

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

##### 6.3.2.2.2 NR SA FR1 non-contention based random access

6.3.2.2.2.1 Test purpose

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

6.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RS-CFRA-ForHO.

6.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.2.

6.3.2.2.2.4 Test description

6.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.2.4.1-1.

Table 6.3.2.2.2.4.1-1: Non-Contention based random access test in FR1 for NR standalone supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 6.3.2.2.2-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.2-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.2.4.1-2.

Table 6.3.2.2.2.4.1-2: Initial conditions for Non-Contention based random access test in FR1 for NR standalone

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.2.2.4.1-1. | | |
| 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 6.3.2.2.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure according to Table 6.3.2.2.2.4.3-3 and Table 6.3.2.2.2.4.3-4.

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

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

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

5.1. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 2.

5.2. Repeat steps 1-3.

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

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

6.1. Repeat steps 1-3.

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

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

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

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

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

7.1. Repeat steps 1-3.

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

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

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

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

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

6.3.2.2.2.4.3 Message contents

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

Table 6.3.2.2.2.4.3-0: Common Exception messages

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

Table 6.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
| Information Element | Value/remark | Comment | Condition |
| FrequencyInfoUL-SIB SEQUENCE { |  |  |  |
| p-Max | 23 | 23 dBm |  |
| } |  |  |  |

Table 6.3.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access

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

Table 6.3.2.2.2.4.3-3: CellGroupConfig for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { |  |  |  |
| spCellConfig SEQUENCE { |  |  |  |
| servCellIndex | ServCellIndex |  |  |
| reconfigurationWithSync SEQUENCE { |  |  |  |
| newUE-Identity | 1 |  |  |
| t304 | ms1000 |  |  |
| rach-ConfigDedicted |  |  |  |
| uplink | RACH-ConfigDedicated |  |  |
| } |  |  |  |
| spCellConfigDedicated SEQUENCE { |  |  |  |
| firstActiveDownlinkBWP-Id | BWP-Id |  |  |
| uplinkConfig SEQUENCE { |  |  |  |
| initialUplinkBWP SEQUENCE { |  |  |  |
| srs-Config | SRS-Config |  |  |
| } |  |  |  |
| firstActiveUplinkBWP-Id | BWP-Id |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.2.2.2.4.3-4: RACH-ConfigDedicated for Non-Contention Based Random Access

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

Table 6.3.2.2.2.4.3-5: RACH-ConfigGeneric for Non-Contention Based Random Access

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

Table 6.3.2.2.2.4.3-6: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommonSIB ::= SEQUENCE { |  |  |  |
| ssb-PositionsInBurst SEQUENCE { |  |  |  |
| inOneGroup | ‘1100 0000’B |  |  |
| } |  |  |  |
| ss-PBCH-BlockPower | -5 |  |  |
| } |  |  |  |

6.3.2.2.2.5 Test requirement

Table 6.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.2.5-2, 6.3.2.2.2.5-3 and 6.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR1 for NR Standalone

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Subtest 1 | Subtest 2 | Comments |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | SSB.1 FR1 | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Config 2 | SSB.2 FR1 | SSB.2 FR1 |
| Number of SSBs per SS-burst | | |  | 2 | 2 | Different from the definition in A.3.10 |
| SS/PBCH block index | | |  | 0,1 | 0,1 | Different from the definition in A.3.10 |
| CSI-RS Configuration | | Config 1 |  | N/A | CSI-RS.1.1 FDD | As defined in A.3.1.4 |
| Config 2 | CSI-RS.2.1 TDD |
| Duplex Mode for Cell 1 | | Config 1 |  | FDD | FDD |  |
| Config 2 | TDD | TDD |
| TDD Configuration | | Config 2 |  | TDDConf.2.1 | TDDConf.2.1 |  |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | OCNG pattern 1 | As defined in A. 2.1. |
| PDSCH parameters Note 4 | | Config 1 |  | SR.1.1 FDD | SR.1.1 FDD | As defined in A.1.1. |
| Config 2 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 TDD | CR.1.1 TDD |  |
| Config 2 |  | CR.2.1 TDD | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.1 TDD | CCR.1.1 TDD |  |
| Config 2 |  | CCR.2.1 TDD | CCR.2.1 TDD |  |
| NR RF Channel Number | | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 | -98 |
| Config 2 | -101 | -101 |
|  | | dB | 3 | 3 |
| SS-RSRP Note 3 | Config 1 | dBm/15kHz | -95 | -95 |
| Config 2 | -98 | -98 |
| SS-RSRP Note 3 | | dBm/ SCS | -95 | -95 |
| SSB with index 1 |  | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 | -98 |
| Config 2 | -101 | -101 |
|  | | dB | -17 | -17 |
| SS-RSRP Note 3 | Config 1 | dBm/15kHz | -115 | -115 |
| Config 2 | -118 | -118 |
| SS-RSRP Note 3 | | dBm/ SCS | -115 | -115 |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 2 | -62.2/38.16MHz | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | |  | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A. 7.1. |
| Propagation Condition | | | - | AWGN | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void.  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | | |

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

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

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

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

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

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

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

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

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Table 6.3.2.2.2.5-2 Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 19.1 dB |

Table 6.3.2.2.2.5-3 Relative power tolerance Test requirements

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

Table 6.3.2.2.2.5-4: Te Timing error Test requirements

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

##### 6.3.2.2.3 NR SA FR1 2-step contention based random access

6.3.2.2.3.1 Test purpose

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

6.3.2.2.3.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards and twoStepRACH-r16.

6.3.2.2.3.3 Minimum conformance requirement

Same as in clause 4.3.2.2.3.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.3.

6.3.2.2.3.4 Test description

6.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.3.4.1-1.

Table 6.3.2.2.3.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 6.3.2.2.3-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.3-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of ΔDL and ΔUL according to the following principles:

With the UE configured to report SS-RSRP, the ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP\_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.3.4.1-2.

Table 6.3.2.2.3.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in 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 6.3.2.2.3.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC\_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

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

4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

5.1. Repeat steps 1-3.

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

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

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

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

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

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

6.1. Repeat steps 1-3.

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

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

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

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

6.6 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

6.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 6.3.2.2.3.4.3-0: Common Exception messages

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

6.3.2.2.3.5 Test requirement

Table 6.3.2.2.3.5-2 defines the primary level settings for contention based random access test in FR1 for NR Standalone.

Table 6.3.2.2.1.5-1: General test parameters

| Parameter | | | Unit | Test-1 | Comments |
| --- | --- | --- | --- | --- | --- |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Config 2 | SSB.2 FR1 |
| Number of SSBs per SS-burst | | |  | 2 | Different from the definition in A.3.1 |
| SS/PBCH block index | | |  | 0,1 | Different from the definition in A.3.1 |
| Duplex Mode for Cell 2 | | Config 1 |  | FDD |  |
| Config 2 | TDD |
| TDD Configuration | | Config 2 |  | TDDConf.2.1 |  |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.2 TDD |  |
| OCNG Pattern Note 1 | | |  | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 |  | SR.1.1 FDD | As defined in A.1.1 |
| Config 2 | SR.2.1 TDD |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | 3 |
| SS-RSRP | Config 1 | dBm/15kHz | -95 |
| Config 2 | -98 |
| SS-RSRP | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | -17 |
| SS-RSRP | Config 1 | dBm/15kHz | -115 |
| Config 2 | -118 |
| SS-RSRP | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 2 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | |  | FR1 MsgA configuration 1 | As defined in FFS. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting MsgA:

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

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.

- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.

- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Table 6.3.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 19.1 dB |

Table 6.3.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 19.1 dB |

Table 6.3.2.2.3.5-3: Relative power tolerance Test requirements

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

Table 6.3.2.2.3.5-4: Te Timing error Test requirements

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

##### 6.3.2.2.4 NR SA FR1 2-step non-contention based random access

6.3.2.2.4.1 Test purpose

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

6.3.2.2.4.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards and twoStepRACH-r16.

6.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.4.

6.3.2.2.4.4 Test description

6.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.4.4.1-1.

Table 6.3.2.2.4.4.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Test Case ID | Test Config Index | Description |
| 6.3.2.2.4-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.4-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of ΔDL and ΔUL according to the following principles:

With the UE configured to report SS-RSRP, the ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP\_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.4.4.1-2.

Table 6.3.2.2.4.4.1-2: Initial conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in 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 6.3.2.2.4.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.4.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

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 Table 6.3.2.2.1.5-1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure according to Table 6.3.2.2.2.4.3-3 and Table 6.3.2.2.2.4.3-4.

4. Test 1: Correct behaviour when transmitting MsgA:

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

4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

5.1. Repeat steps 1-3.

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

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

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

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

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

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

6.1. Repeat steps 1-3.

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

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

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

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

6.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 6.3.2.2.4.4.3-0: Common Exception messages

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

6.3.2.2.4.5 Test requirement

Table 6.3.2.2.4.5-2 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone.

Table 6.3.2.2.1.5-1: General test parameters

| Parameter | | | Unit | Test-1 | Comments |
| --- | --- | --- | --- | --- | --- |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Config 2 | SSB.2 FR1 |
| Number of SSBs per SS-burst | | |  | 2 | Different from the definition in A.3.1 |
| SS/PBCH block index | | |  | 0,1 | Different from the definition in A.3.1 |
| Duplex Mode for Cell 2 | | Config 1 |  | FDD |  |
| Config 2 | TDD |
| TDD Configuration | | Config 2 |  | TDDConf.2.1 |  |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.2 TDD |  |
| OCNG Pattern Note 1 | | |  | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 |  | SR.1.1 FDD | As defined in A.1.1 |
| Config 2 | SR.2.1 TDD |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | 3 |
| SS-RSRP | Config 1 | dBm/15kHz | -95 |
| Config 2 | -98 |
| SS-RSRP | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | -17 |
| SS-RSRP | Config 1 | dBm/15kHz | -115 |
| Config 2 | -118 |
| SS-RSRP | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 2 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | |  | FR1 MsgA configuration 2 | As defined in FFS. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting MsgA:

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

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

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

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Table 6.3.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 19.1 dB |

Table 6.3.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 19.1 dB |

Table 6.3.2.2.4.5-3: Relative power tolerance Test requirements

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

Table 6.3.2.2.4.5-4: Te Timing error Test requirements

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

#### 6.3.2.3 RRC connection release with redirection

##### 6.3.2.3.0 Minimum conformance requirements

6.3.2.3.0.1 Minimum conformance requirements for FR1 RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within Tconnection\_release\_redirect\_NR.

The time delay (Tconnection\_release\_redirect\_NR) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [2]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay (Tconnection\_release\_redirect\_NR) shall be less than:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- SSB\_RP and SSB Ês/Iot according to Annex B.2.5 for a corresponding NR Band.

TRRC\_procedure\_delay: It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause 6.2.2 of TS 38.331 [2].

Tidentify-NR: It is the time to identify the target NR cell and depend on the frequency range (FR) of the target NR cell. It is defined in table 6.3.2.3.0.1-1. Note that Tidentify-NR = TPSS/SSS-sync + Tmeas, in which TPSS/SSS-sync is the cell search time and Tmeas is the measurement time due to cell selection criteria evaluation.

TSI-NR: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. TSI-NR = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

TRACH: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in Table 6.3.3.2-2 [6] or Table 6.3.3.2-3 [6] for FR1 and in Table 6.3.3.2-4 [6] for FR2.

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with Trs = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,

- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 6.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

|  |  |
| --- | --- |
| Frequency range (FR) of target NR cell | Tidentify-NR |
| FR1 | MAX (680 ms, [11] x Trs) |
| FR2 | MAX (880 ms, 8x[11] x Trs) |
| Note : If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2*prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.1.

6.3.2.3.0.2 Minimum conformance requirements for FR1 – E-UTRAN RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target E-UTRAN cell within Tconnection\_release\_redirect\_E-UTRA.

The time delay (Tconnection\_release\_redirect\_E-UTRA) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [2]) on the PDSCH and the time the UE starts to send random access to the target E-UTRA cell. The time delay (Tconnection\_release\_redirect\_E-UTRA) shall be less than:

Tconnection\_release\_redirect\_E-UTRA = TRRC\_procedure\_delay + Tidentify-E-UTRA + TSI-E-UTRA + TRACH

The target E-UTRA FDD or TDD cell shall be considered detectable when for each relevant SSB:

- RSRP related conditions in the accuracy requirements in Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15],

- RSRQ related conditions in the accuracy requirements in Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15],

- RS-SINR related conditions in the accuracy requirements in Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15].

TRRC\_procedure\_delay: It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause 6.2.2 of TS 38.331 [2].

Tidentify-E-UTRA: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

TSI-E-UTRA: It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released. TSI-E-UTRA = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target E-UTRA cell before the RRC connection is released by the old NR cell.

TRACH: It is the delay caused due to the random access procedure when sending random access to the target E-UTRA cell.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.2.

##### 6.3.2.3.1 NR SA FR1 RRC connection release with redirection

6.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR to NR.

6.3.2.3.1.2 Test applicability

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

6.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.1.

6.3.2.3.1.4 Test description

6.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.1.4.1-1.

Table 6.3.2.3.1.4.1-1: Redirection from NR to NR test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 6.3.2.3.1-1 | Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.3.1-2 | Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.3.1-3 | Source cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.1.4.1-2.

Table 6.3.2.3.1.4.1-2: Initial conditions for Redirection from NR to NR test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.3.1.4.1-1. | | |
| 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 parameters for PCell and neighbour cell are given in Table 6.3.2.3.1.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.1.4.3.

3. There are two carriers and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.3.2.3.1.4.1-3: General test parameters for Redirection from NR to NR test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 2.3 |  |

6.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The “*RRCRelease*” message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

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 6.3.2.3.1.5-1. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.

5. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.

7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.3.1.4.3 Message contents

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

Table 6.3.2.3.1.4.3-1: RRCRelease for NR RRC redirection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcRelease SEQUENCE { | |  |  |  |
| redirectedCarrierInfo CHOICE { | |  |  |  |
| nr SEQUENCE { | |  |  |  |
| carrierFreq | | ARFCN-ValueNR | Frequency of Cell 2 |  |
| ssbSubcarrierSpacing | | kHz15 |  | Config 1,2 |
|  | | kHz30 |  | Config 3 |
| smtc SEQUENCE { | |  |  |  |
| duration | | sf1 |  | SMTC.1 |
|  | | sf5 |  | SMTC.2 |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.3.2.3.1.4.3-2: SIB2

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SIB2 ::= SEQUENCE { |  |  |  |
| cellReselectionInfoCommon SEQUENCE { |  |  |  |
| rangeToBestCell | Not present |  |  |
| } |  |  |  |

6.3.2.3.1.5 Test requirement

Table 6.3.2.3.1.5-1 defines the primary level settings for Redirection from NR to NR test case.

Table 6.3.2.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
| T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
| Config 2,3 | TDD | | | | | | |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | | | | | | |
| Config 2 | SSB.1 FR1 | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD | | | | | | |
| Config 2 | TRS.1.1 TDD | | | | | | |
| Config 3 | TRS.1.2 TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | |
| Config 3 | SR 2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | |
| Config 3 | CR 2.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC configuration | | Config 1,2 |  | SMTC.1 | | | | | | |
| Config 3 | SMTC.2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | |
| Config 3 | | -95 | | | | | | |
|  | | | dB | 4 | 4 | | -infinity | | 4 | |
|  | | | dB | 4 | 4 | | -infinity | | 4 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 | -64.59 | | -70.05 | | -64.59 | |
| Config 3 | | dBm/  38.16MHz | -58.49 | -58.49 | | -63.94 | | -58.49 | |
| 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 2240 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH,

where:

TRRC\_procedure\_delay = 110 ms and is specified in clause 12 in TS 38.331 [13].

Tidentify-NR = 680 ms in the test.

TSI-NR = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

TRACH = 170 ms in the test.

This gives a total of 2240 ms.

##### 6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection

6.3.2.3.2.1 Test purpose

This test is to verify RRC connection release with redirection from NR to E-UTRAN.

6.3.2.3.2.2 Test applicability

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

6.3.2.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.2.

6.3.2.3.2.4 Test description

6.3.2.3.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.2.4.1-1.

Table 6.3.2.3.2.4.1-1: Redirection from NR to E-UTRAN test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 6.3.2.3.2-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.3.2.3.2-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.2.3.2-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.2.3.2-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.3.2.3.2-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.3.2.3.2-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.2.4.1-2.

Table 6.3.2.3.2.4.1-2: Initial conditions for Redirection from NR to E-UTRAN test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| DUT Part | A.3.2.3.2 |
| Exceptions to connection diagram | N/A | |  |

1. The general test parameters settings are given in Table 6.3.2.3.2.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.2.4.3.

3. There are two cells specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.2.3.2.4.1-3: General test parameters for Redirection from NR to E-UTRAN test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 2.3 |  |

6.3.2.3.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The “*RRCRelease*” message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

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 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall start T2 timer when the last TTI containing the *RRCRelease* message is sent to UE.

5. When T2 starts, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.2.5-1 for Cell 1 and Table 6.3.2.3.2.5-2 for Cell 2.

6. The UE shall transmit RRCConnectionRequest message.

7. If the UE transmits the PRACH to Cell 2 less than 2205 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 T2 expires, the UE shall be switched off. 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 and Cell 2 shall be powered OFF.

9. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

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

6.3.2.3.2.4.3 Message contents

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

Table 6.3.2.3.2.4.3-1: RRCRelease for Inter-RAT RRC redirection

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcRelease SEQUENCE { | |  |  |  |
| redirectedCarrierInfo CHOICE { | |  |  |  |
| eutra SEQUENCE { | |  |  |  |
| eutraFrequency | | ARFCN-ValueEUTRA | Frequency of Cell 2 |  |
| cnType | | epc |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

6.3.2.3.2.5 Test requirement

Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2 define the primary level settings for Redirection from NR to E-UTRAN test case.

Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 1)

| Parameter | | | Unit | Cell 1 | | |
| --- | --- | --- | --- | --- | --- | --- |
| T1 | | T2 |
| RF Channel Number | | |  | 1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | |
| Config 2,3,5,6 | TDD | | |
| SSB Configuration | | Config 1,4 |  | SSB.1 FR1 | | |
| Config 2,5 | SSB.1 FR1 | | |
| Config 3,6 | SSB.2 FR1 | | |
| CSI-RS for tracking | | Config 1,4 |  | TRS.1.1 FDD | | |
| Config 2,5 | TRS.1.1 TDD | | |
| Config 3,6 | TRS.1.2 TDD | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| BWP BW | | Config 1,4 | MHz | 10: NRB,c = 52 | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| DRx Cycle | | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR2.1 TDD | | |
| CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR2.1 TDD | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | |
| SMTC configuration | | Config 1,2,4,5 |  | SMTC.1 FR1 | | |
| Config 3,6 | SMTC.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | |
| Config 3,6 | 30 kHz | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | |
| Config 3,6 | 30 kHz | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | |
| Initial UL BWP |  | ULBWP.0.1 | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -98 | | |
| Config 3,6 | | -95 | | |
|  | | | dB | 4 | 4 | |
|  | | | dB | 4 | 4 | |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -64.59 | -64.59 | |
| Config 3,6 | | dBm/  38.16MHz | -58.49 | -58.49 | |
| 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 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 2)

| Parameter | Unit | Configuration | Cell 2 | |
| --- | --- | --- | --- | --- |
| T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: NRB,c = 25  10MHz: NRB,c = 50  20MHz: NRB,c = 100 | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | |
| 4, 5, 6 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5MHz: R.7 FDD  10MHz: R.3 FDD  20MHz: R.6 FDD | |
| 4, 5, 6 | 5MHz: R.4 TDD  10MHz: R.0 TDD  20MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5MHz: R.11 FDD  10MHz: R.6 FDD  20MHz: R.10 FDD | |
| 4, 5, 6 | 5MHz: R.11 TDD  10MHz: R.6 TDD  20MHz: R.10 TDD | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5MHz: OP.20 FDD  10MHz: OP.10 FDD  20MHz: OP.17 FDD | |
| 4, 5, 6 | 5MHz: OP.9 TDD  10MHz: OP.1 TDD  20MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -64.76 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.  Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: 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 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27]. | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

Tconnection\_release\_redirect\_E-UTRA = TRRC\_procedure\_delay + Tidentify-E-UTRA + TSI-E-UTRA + TRACH,

where:

TRRC\_procedure\_delay = 110 ms and is specified in clause 12 in TS 38.331 [2].

Tidentify- E-UTRA = 800 ms in the test.

TSI- E-UTRA = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target E-UTRAN cell.

TRACH = 15 ms in the test.

This gives a total of 2205 ms.

### 6.3.3 Conditional handover

#### 6.3.3.0 Minimum conformance requirements

##### 6.3.3.0.1 Minimum conformance requirements for NR FR1 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

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

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

Where:

TRRC is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

Tmeasure is the measurements time stated in TS 38.133 [6] clause 6.1.4.2.2.

TCHO\_execution is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

Tinterrupt is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

[TS 38.133, clause 6.1.4.2.2]

The measurement time delay is defined from the end of TEvent\_DU until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra with index or Tidentify\_intra\_without\_index defined in clause 9.2.5.1 or clause 9.2.6.2.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover. If a cell which has been detectable at least for the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than TSSB\_measurement\_period\_intra or TSSB\_measurement\_period\_inter provided the timing to that cell has not changed more than ± 3200/ Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.2.3]

TCHO\_execution is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. TCHO\_execution can be up to 10ms.

[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms

Where:

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

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

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

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

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

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.[TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

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

- SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within Tidentify\_intra\_without\_index if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

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 TS 38.133 [6] Table 9.2.5.1-1.

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.2.5.1-3.

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in TS 38.133[6] Table 9.2.5.2-1.

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.

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

Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 Note 2x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

Table 9.2.5.1-3: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 Note 2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

[TS 38.133, clause 9.2.5.2]

The measurement period for intra-frequency measurements without gaps is as shown in TS 38.133 [6] Table 9.2.5.2-1.

Table 9.2.5.2-1: 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 SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil( 5 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

[TS 38.133, clause 10.1.2.1.1]

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR1. The accuracy requirements in this clause are also applicable when *highSpeedMeasFlag-r16* is configured.

The accuracy requirements in TS 38.133 [6] Table 10.1.2.1.1-1 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 for each relevant SSB.

Table 10.1.2.1.1-1: 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 | Depending on band group | -121+ ΔBG\_offset | -118+ ΔBG\_offset | N/A | -70 |
| ±8 | ±11 | ≥-6 | Depending on band group | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 3: For NR operating band groups, ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | |

[TS 38.133, annex B.2.2]

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum SSB\_RP | | SSB Ês/Iot |
| dBm / SCSSSB | | dB |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| Conditions | Depending on band group | -127+ ΔBG\_offset | -124+ ΔBG\_offset | ≥ -6 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2.  NOTE 2: For NR operating band groups, ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | |

##### 6.3.3.0.2 Minimum conformance requirements for NR FR1 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

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

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

Where:

TRRC is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

Tmeasure is the measurements time stated in TS 38.133 [6] clause 6.1.4.2.2.

TCHO\_execution is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

Tinterrupt is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

[TS 38.133, clause 6.1.4.2.2]

The measurement time delay is defined from the end of TEvent\_DU until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra with index or Tidentify\_intra\_without\_index defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index defined in clause 9.3.4.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover. If a cell which has been detectable at least for the time period Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index for intra-frequency handover or Tidentify\_inter\_without\_index for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than TSSB\_measurement\_period\_intra or TSSB\_measurement\_period\_inter provided the timing to that cell has not changed more than ± 3200/ Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.2.3]

TCHO\_execution is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. TCHO\_execution can be up to 10ms.

[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms

Where:

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

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

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

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

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

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

[TS 38.133, clause 9.3.2]

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.4 for FR1, for a corresponding Band,

- SSB\_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in 38.133 [6] Table 9.3.4-1.

TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in 38.133 [6] Table 9.3.4-3.

TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in 38.133 [6] Table 9.3.5-1.

CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range FR1)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX | Max(600ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\*1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

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

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

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

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

[TS 38.133, clause 10.1.4.1.1]

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 10.1.4.1.1-1 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 inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.4.1.1-1: 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 | Depending on band group | -121+ ΔBG\_offset | -118+ ΔBG\_offset | N/A | -70 |
| ±8 | ±11 | ≥-6 | Depending on band group | 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 3.5.2.  NOTE 4: For NR operating band groups, ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | |

[TS 38.133, annex B.2.3]

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum SSB\_RP | | SSB Ês/Iot |
|  |  | dBm / SCSSSB | | dB |
|  |  | SCSSSB = 15 kHz | SCSSSB = 30 kHz |  |
| Conditions | Depending on band group | -125+ ΔBG\_offset | -122+ ΔBG\_offset | ≥ -4 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2.  NOTE 2: For NR operating band groups, ΔBG\_offset is defined in clause 3A.4, Table 3A.4.1-2. | | | | |

#### 6.3.3.1 NR SA FR1 conditional handover

6.3.3.1.1 Test purpose

To verify the requirement for the NR FR1 intra-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.2

6.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

6.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.1.

6.3.3.1.4 Test description

6.3.3.1.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.3.1.4.1-1.

Table 6.3.3.1.4.1-1: NR SA FR1 conditional handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 6.3.3.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.3.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.3.1-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.1.4.1-2

Table 6.3.3.1.4.1-2: Initial conditions for NR SA FR1 conditional handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.1.4.1-1 | | |
| 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 6.3.3.1.4.3.

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

3. The test parameters are given in Table 6.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.3.1.4.1-3: General test parameters NR SA FR1 conditional handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset in condition | | dB | -1 |  |
| 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. |
| PRACH configuration index | |  | FR1 PRACH configuration 1 | As specified in table Table 6.3.3.2-3 in TS 38.211 [7] |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

6.3.3.1.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.1.4.1-3 and 6.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than TRRC ms before the beginning of T2. No interruption shall be observed in time period T1, where

- TRRC = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the start of T2. The Interruption length Tinterrupt shall also be verified in T2.

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

2. Set the parameters according to T1 in Table 6.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.1.5-1. T2 starts.

7. If

1. the UE transmits the PRACH preambles to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the beginning of time period T2,

and

1. no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- X = Tinterrupt +k1 for test configuration 6.3.3.1-1

- X = Tinterrupt for test configuration 6.3.3.1-2

- X = 2∙Tinterrupt  for test configuration 6.3.3.1-3.

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

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

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

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

6.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.3.3.1.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR\_MEAS and CHO | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| measConfig | | MeasConfig | Table 6.3.3.1.4.3-2 |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| conditionalReconfiguration-r16 | | ConditionalReconfiguration | Table 6.3.3.1.4.3-5 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.3.3.1.4.3-2: MeasConfig (Table 6.3.3.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR | Table 6.3.3.1.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 6.3.3.1.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry |  |  |
| MeasIdToAddMod[1] SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measObjectId | 1 |  |  |
| reportConfigId | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 |  |  |
| } |  |  |  |

Table 6.3.3.1.4.3-3: MeasObjectNR (Table 6.3.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { |  |  |  |
| ssbFrequency | ARFCN-ValueNR for PCell |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 6.3.3.1.4.3-4: ReportConfigNR (Table 6.3.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| condTriggerConfig SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -2 | actuall value = -2\*0.5 = -1dB |  |
| } |  |  |  |
| hysteresis | 0 | actuall value = 0\*0.5 = 0dB |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.3.1.4.3-5: ConditionalReconfiguration (Table 6.3.3.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
| Information Element | Value/remark | Comment | Condition |
| ConditionalReconfiguration-r16::= SEQUENCE { |  |  |  |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry |  |  |
| CondReconfigToAddMod-r16 [1] SEQUENCE { |  | entry 1 |  |
| condReconfigId-r16 | 1 |  |  |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry |  |  |
| MeasId[1] | 1 | The MeasId configured in Table 6.3.3.1.4.3-2 |  |
| } |  |  |  |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig\_NoKeyChange) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.3.3.1.5 Test requirements

Table 6.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.3.1.5-1: Cell specific test parameters for NR SA FR1 conditional handover

| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 1 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
|  | | Config 2,3 |  | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
|  | | Config 2 |  | SR.1.1 TDD | | | | | | |
|  | | Config 3 |  | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | | | | |
|  | | Config 3 |  | CR2.1 TDD | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | | | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | |
|  | Config 3 | |  | -95 | | | | | | |
|  | | | dB | 8 | -2.41 | | -Infinity | | 1.36 | |
|  | | | dB | 8 | 8 | | -Infinity | | 10 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -Infinity | | -88 | |
|  | Config 3 | | dBm/SCS | -87 | -87 | | -Infinity | | -85 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -57.67 | | -61.41 | | -57.67 | |
|  | Config 3 | | dBm/  38.16MHz | -55.31 | -50.56 | | -55.31 | | -50.56 | |
| 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 rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt from the start of T2. where:

* Tmeasure = 800 ms, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.
* TCHO\_execution = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.
* Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.
* Tprocessing = 20 ms, is time for UE processing;
* TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
* T∆ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
* Tmargin = 2 ms, is time for SSB post-processing.

This gives a total of 872 ms

The interruption during T2 shall not exceeed Tinterrupt = 62ms.

#### 6.3.3.2 NR SA FR1-FR1 conditional handover

6.3.3.2.1 Test purpose

To verify the requirement for the NR conditional FR1-NR FR1 inter-frequency conditional handover requirements specified in clause 6.1.4.2.

6.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

6.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.2.

6.3.3.2.4 Test description

6.3.3.2.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 6.3.3.2.4.1-1.

Table 6.3.3.2.4.1-1: NR SA FR1-FR1 conditional handover test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 6.3.3.2-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.3.2-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.3.2-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.2.4.1-2

Table 6.3.3.2.4.1-2: Initial conditions for NR SA FR1-FR1 conditional handover

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | | Comment |
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.2.4.1-1 | | |
| 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 6.3.3.2.4.3.

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

3. The test parameters are given in Table 6.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.3.2.4.1-3: General test parameters NR SA FR1-FR1 conditional handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset in handover condition | | dB | -4 |  |
| 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. |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

6.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carrier and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.2.4.1-3 and 6.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than TRRC ms before the beginning of T2. No interruption shall be observed in time period T1, where

* TRRC = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the start of T2. The Interruption length Tinterrupt shall also be verified in T2.

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

2. Set the parameters according to T1 in Table 6.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

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

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.2.5-1. T2 starts.

7. If

1. the UE transmits the PRACH preambles to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt ms from the beginning of time period T2,

and

1. no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- X = Tinterrupt +k1 for test configuration 6.3.3.2-1

- X = Tinterrupt for test configuration 6.3.3.2-2

- X = 2∙Tinterrupt for test configuration 6.3.3.2-3.

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

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

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

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

6.3.3.2.4.3 Message contents

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

Table 6.3.3.2.4.3-1: RRCReconfiguration (Step 4)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR\_MEAS and CHO | | | |
| Information Element | | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | |  |  |  |
| criticalExtensions CHOICE { | |  |  |  |
| rrcReconfiguration SEQUENCE { | |  |  |  |
| measConfig | | MeasConfig | Table 6.3.3.2.4.3-2 |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| nonCriticalExtension SEQUENCE { | |  |  |  |
| conditionalReconfiguration-r16 | | ConditionalReconfiguration | Table 6.3.3.2.4.3-6 |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |
| } | |  |  |  |

Table 6.3.3.2.4.3-2: MeasConfig (Table 6.3.3.2.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: Table H.3.1-2 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { |  |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entry |  |  |
| MeasObjectToAddMod[1] SEQUENCE { |  | entry 1 |  |
| measObjectId | 1 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR-f1 | Table 6.3.3.2.4.3-3 |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod[2] SEQUENCE { |  | entry 2 |  |
| measObjectId | 2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectNR | MeasObjectNR-f2 | Table 6.3.3.2.4.3-4 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry |  |  |
| ReportConfigToAddMod[1] SEQUENCE { |  | entry 1 |  |
| reportConfigId | 1 |  |  |
| reportConfig CHOICE { |  |  |  |
| reportConfigNR | ReportConfigNR | Table 6.3.3.2.4.3-5 |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry |  |  |
| MeasIdToAddMod[1] SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measObjectId | 2 |  |  |
| reportConfigId | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 |  |  |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 |  |  |
| } |  |  |  |

Table 6.3.3.2.4.3-3: MeasObjectNR-f1 (Table 6.3.3.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { |  |  |  |
| ssbFrequency | ARFCN-ValueNR for Cell 1 |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 6.3.3.2.4.3-4: MeasObjectNR-f2 (Table 6.3.3.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { |  |  |  |
| ssbFrequency | ARFCN-ValueNR for Cell 2 |  |  |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 |  |  |
| referenceSignalConfig SEQUENCE { |  |  |  |
| ssb-ConfigMobility SEQUENCE { |  |  |  |
| ssb-ToMeasure | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| absThreshSS-BlocksConsolidation | Not present |  |  |
| } |  |  |  |

Table 6.3.3.2.4.3-5: ReportConfigNR (Table 6.3.3.2.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { |  |  |  |
| reportType CHOICE { |  |  |  |
| condTriggerConfig SEQUENCE { |  |  |  |
| condEventId CHOICE { |  |  |  |
| condEventA3 SEQUENCE { |  |  |  |
| a3-Offset CHOICE { |  |  |  |
| rsrp | -8 | actuall value = -8\*0.5 = -4dB |  |
| } |  |  |  |
| hysteresis | 0 | actuall value = 0\*0.5 = 0dB |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.3.3.2.4.3-6: ConditionalReconfiguration (Table 6.3.3.2.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
| Information Element | Value/remark | Comment | Condition |
| ConditionalReconfiguration-r16::= SEQUENCE { |  |  |  |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry |  |  |
| CondReconfigToAddMod-r16 [1] SEQUENCE { |  | entry 1 |  |
| condReconfigId-r16 | 1 |  |  |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry |  |  |
| MeasId[1] | 1 | The MeasId configured in Table 6.3.3.2.4.3-2 |  |
| } |  |  |  |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig\_NoKeyChange) |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.3.3.2.5 Test requirements

Table 6.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.3.2.5-1: Cell specific test parameters for NR SA FR1-FR1 conditional handover

| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
|  | | Config 2,3 |  | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| Gap pattern ID | | |  | gp0 | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
|  | | Config 2 |  | SR.1.1 TDD | | | | | | |
|  | | Config 3 |  | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | | | | |
|  | | Config 3 |  | CR2.1 TDD | | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
|  | | Config 3 |  | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | | | | |
| Note2 | | | dBm/15kHz | -98 | | | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | -98 | | | |
|  | Config 3 | |  | -95 | | | -95 | | | |
|  | | | dB | 4 | 4 | | -Infinity | | 6.70 | |
|  | | | dB | 4 | 4 | | -Infinity | | 6.70 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -94 | -94 | | -Infinity | | -91.30 | |
|  | Config 3 | | dBm/SCS | -91 | -91 | | -Infinity | | -88.30 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 | -64.59 | | -70.05 | | -62.51 | |
|  | Config 3 | | dBm/  38.16MHz | -58.49 | -58.49 | | -63.94 | | -56.40 | |
| 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 rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + TCHO\_execution + Tinterrupt from the start of T2. where:

- Tmeasure = 920 ms, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

- TCHO\_execution = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

- Tinterrupt = Tprocessing + TIU + T∆ + Tmargin ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

- Tprocessing = 20 ms, is time for UE processing;

- TIU = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;

- T∆ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;

- Tmargin = 2 ms, is time for SSB post-processing.

This gives a total of 992 ms

The interruption during T2 shall not exceeed Tinterrupt = 62ms.