**3GPP TSG-RAN4 Meeting #110 *R4-2400839***

**Athens, GR, Feb 26 - Mar 1, 2024**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | 4056 | **rev** |  | **Current version:** | **18.4.0** |  |
|  | | | | | | | | |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <http://www.3gpp.org/Change-Requests>.* | | | | | | | | |
|  | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | (NR\_ATG-Perf) BigCR to TS 38.133 Correction of core requirements for NR ATG | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CMCC | | | | | | | | | |
| ***Source to TSG:*** | RAN4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_ATG-Perf | | | | |  | ***Date:*** | | | 2024-03-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduce ATG RRM test cases based on the endorsed CRs in RAN4#110, including:   |  |  |  | | --- | --- | --- | | Tdoc | Title | Source | | R4-2403301 | (NR\_ATG-Perf) draftCR to TS 38.133: Introduction of cell re-selection and HO/CHO test cases for ATG | CMCC | | R4-2403311 | DraftCR: RRC re-establishment tests for ATG | Ericsson | | R4-2403298 | Draft CR on test cases for RA and RRC Connection Release with Redirection for ATG | CATT | | R4-2403300 | Draft CR on RRM test case for ATG UE transmit timing | Apple | | R4-2403303 | Draft CR on signalling characteristics test case for ATG | Huawei, HiSilicon | | R4-2403304 | Draft CR on Test case of inter-frequency measurement event triggered report with SSB time index detection | ZTE | | R4-2403305 | Draft CR on Test case of inter-frequency measurement event triggered report without gap | ZTE | | R4-2403306 | Draft CR on Test case of inter-frequency measurement event triggered report without SSB time index detection | ZTE | | R4-2403307 | Draft CR on Test case of intra-frequency measurement event triggered report with per-UE gap | ZTE | | R4-2403308 | Draft CR on Test case of intra-frequency measurement event triggered report with per-UE gap with SSB index reading | ZTE | | R4-2403309 | Draft CR on Test case of intra-frequency measurement event triggered report without gap with SSB index reading | ZTE | | R4-2403310 | Draft CR on Test case of intra-frequency measurement event triggered report without gap without SSB index reading | ZTE | | R4-2403302 | Draft CR on RRM test cases (ATG 5-8 to ATG 5-13) for ATG | LGE | | R4-2403299 | Draft CR on test cases for measurement performance requirements for ATG | CATT | | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce the test cases for ATG RRM requirements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The RRM perf requirements for ATG will be unfinished. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.X(new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**<Start of change>**

## A.X NR standalone tests for ATG

## A.X.1 RRC\_IDLE state mobility

#### A.X.1.1 Cell reselection to FR1 intra-frequency NR case

##### A.X.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements for ATG specified in clause 4.2D.2.3.

##### A.X.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells, supported test configurations are shown in table A.X.1.1.2-1. The test parameters from Table A.6.1.1.1.2-2 and Table A.6.1.1.1.2-2 is used except those described in the tables A.X.1.1.2-2 and A.X.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.1.1.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
|  |  |
| Access Barring Information | - | 1, 2, 3 | not barred | No additional delays in random access procedure. |
| T2 | s | 1, 2, 3 | [40] | T2 needs to be defined so that cell re-selection reaction time is taken into account.  The value applies for UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*] |
| T3 | s | 1, 2, 3 | [15] | T3 needs to be defined so that cell re-selection reaction time is taken into account.  The value applies for UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*] |

Table A.X.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Propagation Condition |  | 1, 2 | AWGN+220Hz | | | | | |
|  | 3 | AWGN+500Hz | | | | | |

##### A.X.1.1.3 Test Requirements

For UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*]:

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

The cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s.

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

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

Where:

Tdetect, NR\_Intra See Table 4.2D.2.3-1 in clause 4.2D.2.3

Tevaluate, NR\_ intra See Table 4.2D.2.3-1 in clause 4.2D.2.3

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB22 are scheduled with 20ms period and 80 ms period, respectively.

For the cell re-selection delay to a newly detectable cell, Tdetect, NR\_ intra + TSI-NR = 33.28 s, allow 34s.

For the cell re-selection delay to an already detected cell in the test case, Tevaluate, NR\_Intra + TSI-NR = 7.68 s, allow 8 s.

#### A.X.1.2 Cell reselection to FR1 inter-frequency NR case

##### A.X.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements for ATG specified in clause 4.2D.2.4.

##### A.X.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.X.1.2.2-1, A.X.1.2.2-2 and A.X.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.1.2.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.1.2.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 |  |
| T3 end condition | Active cell |  | 1, 2, 3 | Cell1 |  |
|  | Neighbour cell |  | 1, 2, 3 | Cell2 |  |
| 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 barred | 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 | 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 | >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.  The value applies for UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18] |
| T3 | | s | 1, 2, 3 | [15] | T3 needs to be defined so that cell re-selection reaction time is taken into account.  The value applies for UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18] |
|  | | | | | |

Table A.X.1.2.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |  | 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 |  | 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 |  | 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 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 16 | -3.11 | 2.79 | -infinity | 2.79 | -3.11 |
|  |  | 2 |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  |  |  |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
|  |  | 2 | -98 | | | | | |
|  |  | 3 | -95 | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | |
|  |  | 2 |  | | | | | |
|  |  | 3 |  | | | | | |
|  | dB | 1 | 16 | 13 | 16 | -infinity | 16 | 13 |
|  |  | 2 |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  |  |  |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -82 | -85 | -82 | -infinity | -82 | -85 |
|  |  | 3 | -79 | -82 | -79 | -infinity | -79 | -82 |
| Io | dBm/9.36 MHz | 1, 2 | -53.94 | -52.21 | -52.21 | Same as parameters specified in Cell 1 columns- | | |
|  | dBm/38.16 MHz | 3 | -47.85 | -46.12 | -46.12 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 60 | | | 60 | | |
| Propagation Condition |  | 1, 2 | AWGN+220Hz | | | | | |
|  | 3 | AWGN+500Hz | | | | | |
| 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. | | | | | | | | |

##### A.X.1.2.3 Test Requirements

For UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18]:

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

The cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s.

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

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

Where:

Tdetect, NR\_Inter See Table 4.2D.2.4-1 in clause 4.2D.2.4

Tevaluate, NR\_ inter See Table 4.2D.2.4-1 in clause 4.2D.2.4

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB22 are scheduled with 20ms period and 80 ms period, respectively.

For the cell re-selection delay to a newly detectable cell, Tdetect, NR\_ inter + TSI-NR = 33.28 s, allow 34s.

For the cell re-selection delay to an already detected cell in the test case, Tevaluate, NR\_Inter + TSI-NR = 7.68 s, allow 8 s.

#### A.X.1.3 Cell reselection to FR1 inter-frequency NR case for UE configured with *hs-ATG-cellReselectionSet-r18*

##### A.X.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements for ATG UE configured with *hs-ATG-cellReselectionSet-r18* and for ATG UE supporting the feature for enhanced RRM requirements *(Enhanced RRM requirements for measurements in IDLE and INACTIVE modes for ATG)* specified in clause 4.2D.2.4.

##### A.X.1.3.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.X.1.3.2-1, A.X.1.3.2-2 and A.X.1.3.2-3. The test consists of two successive time periods, with time duration of T1 and T2. 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.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.1.3.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.1.3.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 |  |
| 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 barred | 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 | 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 | >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 | [20] | T2 needs to be defined so that cell re-selection reaction time is taken into account.  The value applies for UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18] |
|  | | | | | |

Table A.X.1.3.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| 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 |  | 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 |  | 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 |  | 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 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
|  | dB | 1 | 16 | -3.11 | -infinity | 2.79 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| Note2 | dBm/SCS | 1, 2 | -98 | | | |
|  |  | 2 | -95 | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | |
|  |  | 2 |
|  |  | 3 |  | | | |
|  | dB | 1 | 16 | 13 | -infinity | 16 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -82 | -85 | -infinity | -82 |
|  |  | 3 | -79 | -82 | -infinity | -79 |
| Io | dBm/9.36 MHz | 1, 2 | -53.94 | -52.21 | Same as parameters specified in Cell 1 columns- | |
|  | dBm/38.16 MHz | 3 | -47.85 | -46.12 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 60 | | 60 | |
| Propagation Condition |  | 1, 2 | AWGN+220Hz | | | |
|  | 3 | AWGN+500Hz | | | |
| 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. | | | | | | |

##### A.X.1.2.3 Test Requirements

For UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18]:

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

The cell re-selection delay to a newly detectable cell shall be less than 12 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect, NR\_Inter\_enh + TSI-NR

Where:

Tdetect, NR\_Inter\_enh See Table 4.2D.2.4-2 in clause 4.2D.2.4

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB22 are scheduled with 20ms period and 80 ms period, respectively.

For the cell re-selection delay to a newly detectable cell, Tdetect, NR\_ inter\_enh + TSI-NR = 11.52 s, allow 12s.

## A.X.2 RRC\_CONNECTED state mobility

### A.X.2.1 Handover

#### A.X.2.1.1 Intra-frequency handover from FR1 to FR1; known target cell

##### A.X.2.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements for ATG specified in clause 6.1E.1.2.

##### A.X.2.1.1.2 Test Parameters

Supported test configurations are shown in table A.X.2.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.6.3.1.1.2-2 and Table A.6.3.1.1.2-3 except those described in the table A.X.2.1.1.2-2 and A.X.2.1.1.2-3.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.2.1.1.2-1: 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 |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.2.1.1.2-2: General test parameters Intra-frequency handover from FR1 to FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Access Barring Information | - | not barred | No additional delays in random access procedure. |

Table A.X.2.1.1.2-3: 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 |
| Propagation condition | Config 1, 2 | - | AWGN+220Hz | | | AWGN+220Hz | | | |
|  | Config 3 |  | AWGN+500Hz | | | AWGN+500Hz | | | |

##### A.X.2.1.2.3 Test Requirements

For UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18]:

The UE shall start to transmit the PRACH to Cell 2 less than 72 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 = 62 ms in the test. Tinterrupt is defined in clause 6.1E.1.2.2.

#### A.X.2.1.2 Inter-frequency handover from FR1 to FR1; unknown target cell

##### A.X.2.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements for ATG specified in clause 6.1E.1.2.

##### A.X.2.1.2.2 Test Parameters

Supported test configurations are shown in table A.X.2.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.6.3.1.3.2-2 and Table A.6.3.1.3.2-3 except those described in the table A.X.2.1.2.2-2 and A.X.2.1.2.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.2.1.2.2-1: 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 |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.2.1.2.2-2: General test parameters Inter-frequency handover from FR1 to FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Access Barring Information | - | not barred | No additional delays in random access procedure. |
| Time offset between cells |  | 3 μs | Synchronous cells |

Table A.X.2.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| Propagation condition | Config 1, 2 | - | AWGN + 220Hz | | AWGN + 220Hz | |
|  | Config 3 |  | AWGN + 500Hz | | AWGN + 500Hz | |

##### A.X.2.1.2.3 Test Requirements

For UEs that don’t support antennaArrayType-r18[and UEs that support antennaArrayType-18]:

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 6.1E.1.2.2.

This gives a total of 132 ms.

### A.X.2.2 Conditional Handover

#### A.X.2.2.1 Intra-frequency distance-based conditional Handover from FR1 to FR1

##### A.X.2.2.1.1 Test Purpose and Environment

This test is to verify the requirement for intra-frequency distance-based conditional handover from FR1 to FR1 for ATG specified in clause 6.1E.2.

##### A.X.2.2.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in table A.X.2.2.1.2-1, and A.X.2.2.1.2-2. Both handover delay and interruption length are tested.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell. The RRC message implying distance-based handover to cell 2 with Event D1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

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

The specific gNB reference location is emulated by test system.

Table A.X.2.2.1.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | 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 |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.2.2.1.2-2: General test parameters for Intra-frequency distance-based conditional handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1 |  |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| UE position (N,S, H) at T1 start | |  | [(0, 0, 3000)] | Set by AT command |
| UE moving speed | | km/h | [(1200, 0, 0)] | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | [(-4600, 0, 0)] | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | [(14479, 0, 0)] | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | [200] | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | [200] | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 |  |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 |  |
| A3-Offset in condition | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 15 |  |
| T2 | | s | ≤ 6 |  |

Table A.X.2.2.1.2-3: Cell specific test parameters for Intra-frequency distance-based conditional handover from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| 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, 2 | MHz | 10: NRB,c = 52 | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | Config 1, 2, 3 | 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 | | Config 1, 2, 3 |  | OP.1 | | | |
| SMTC Configuration | | Config 1, 2, 3 |  | 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, 3 | kHz | 15 kHz | | | |
|  | | Config 3 |  | 30 kHz | | | |
| PRACH configuration | | Config 1, 2, 3 |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2, 3 |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1, 2, 3 | dBm/ 15kHz | -98 | | | |
| Note2 | | Config 1, 2 | dBm/ SCS | -98 | | | |
|  | | Config 3 |  | -95 | | | |
|  | | Config 1, 2, 3 | dB | 8 | -3.3 | -Infinity | 2.36 |
|  | | Config 1, 2, 3 | dB | 8 | 8 | -Infinity | 11 |
| SSB\_RP | | Config 1, 2 | dBm/ SCS | -90 | -90 | -Infinity | -87 |
|  | | Config 3 |  | -87 | -87 | -Infinity | -84 |
| IoNote3 | | Config 1, 2 | dBm/ 9.36MHz | -61.41 | -57.06 | -61.41 | -57.06 |
|  | | Config 3 | dBm/  38.16MHz | -55.31 | -50.96 | -55.31 | -50.96 |
| Propagation condition | | Config 1, 2 | - | AWGN + 2412HzNote4 | | | |
|  | | Config 3 |  | AWGN + 5556HzNote5 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 2412Hz is the maximum value of doppler with carrier frequency of 2170MHz. The specific doppler shift trajectory is up to test system’s design considering of BS location and UE GNSS emulation.  Note 5: 5556Hz is the maximum value of doppler with carrier frequency of 5GHz. The specific doppler shift trajectory is up to test system’s design considering of BS location and UE GNSS emulation. | | | | | | | |

##### A.X.2.2.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 872 ms from the beginning of time period T2.

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

NOTE: The handover delay is defined in clause 6.1E.2, can be expressed as:

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

where:

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

TEvent\_DU = start of T2

At start of T2,

distance to source cell reference location is = 10057.8m, and D1-1 = 10000m

distance to target cell reference location is = 9942.4m, and D1-2 = 10000m

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

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

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

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

#### A.X.2.2.2 Inter-frequency distance-based conditional Handover from FR1 to FR1

##### A.X.2.2.2.1 Test Purpose and Environment

This test is to verify the requirement for inter-frequency distance-based conditional handover from FR1 to FR1 for ATG specified in clause 6.1E.2.

##### A.X.2.2.2.2 Test Parameters

The test scenario comprises of 2 NR carrier and one cell on each carrier as given in table A.X.2.2.2.2-1, and A.X.2.2.2.2-2. Both handover delay and interruption length are tested.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure inter-frequency neighbour cell and Gap pattern ID gp0. The RRC message implying distance-based handover to cell 2 with Event D1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and offset better than cell 1 and after 9976ms of T2, location condition event condEventD1-r17 is fulfilled.

The specific gNB reference location is emulated by test system.

Table A.X.2.2.2.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | 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 |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.X.2.2.2.2-2: General test parameters for Inter-frequency distance-based conditional 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 |  |
| UE position (N,S, H) at T1 start | |  | [(0, 0, 3000)] | Set by AT command |
| UE moving speed | | km/h | [(1200, 0, 0)] | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | [(-4600, 0, 0)] | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | [(14479, 0, 0)] | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | [200] | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | [200] | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 |  |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 |  |
| A3-Offset in condition | | dB | -4 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤ 16 |  |

Table A.X.2.2.2.2-3: Cell specific test parameters for Inter-frequency distance-based conditional handover from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| RF channel number | | Config 1, 2, 3 |  | 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, 2 | MHz | 10: NRB,c = 52 | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | | Config 1, 2 | MHz | 10: NRB,c = 52 | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | Config 1, 2, 3 | 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 |  | 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 | | Config 1, 2, 3 |  | OP.1 | | | |
| SMTC Configuration | | Config 1, 2, 3 |  | 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 | | Config 1, 2, 3 |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2, 3 |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1, 2, 3 | dBm/ 15kHz | -98 | | | |
| Note2 | | Config 1, 2 | dBm/ SCS | -98 | | | |
|  | | Config 3 |  | -95 | | | |
|  | | Config 1, 2, 3 | dB | 4 | 4 | -Infinity | 5 |
|  | | Config 1, 2, 3 | dB | 4 | 4 | -Infinity | 5 |
| SSB\_RP | | Config 1, 2 | dBm/ SCS | -94 | -94 | -Infinity | -93 |
|  | | Config 3 |  | -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 | | Config 1, 2 | - | AWGN + 2412HzNote4 | | | |
|  | | Config 3 |  | AWGN + 5556HzNote5 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 2412Hz is the maximum value of doppler with carrier frequency of 2170MHz. The specific doppler shift trajectory is up to test system’s design considering of BS location and UE GNSS emulation.  Note 5: 5556Hz is the maximum value of doppler with carrier frequency of 5GHz. The specific doppler shift trajectory is up to test system’s design considering of BS location and UE GNSS emulation. | | | | | | | |

##### A.X.2.2.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 later than 9976ms and less than 10048 ms from the beginning of time period T2.

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

NOTE: The handover delay is defined in clause 6.1E.2, can be expressed as:

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

where:

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

TEvent\_DU = start of T2

At 9976ms after start of T2,

distance to source cell reference location is = 10050.2m, and D1-1 = 10000m

distance to target cell reference location is = 9949.08m, and D1-2 = 10000m

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

Tmeasure = max(600 + 200 ms, 9976ms) = 9976 ms;

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

This gives a total of 9976ms + 62ms + 10ms = 10048 ms.

### A.X.2.3 RRC Connection Mobility Control

#### A.X.2.3.1 SA: RRC Re-establishment

##### A.X.2.3.1.1 Intra-frequency RRC Re-establishment in FR1 for ATG

###### A.X.2.3.1.1.1 Test Purpose and Environment

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 for ATG. These tests will verify the requirements in clause 6.2D.1.

The test parameters are the same as those specified in clause A.6.3.2.1.1 except those described in the following clause. Supported test configurations are listed in Table A.X.2.3.1.1.1-1. The listed parameter values in Table A.X.2.3.1.1.1-2 will replace the values of corresponding parameters in Tables A.6.3.2.1.1.1-2 and A.6.3.2.1.1.1-3.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.2.3.1.1.1-1: Supported test configurations for ATG

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

Table A.X.2.3.1.1.1-2: Modified test parameters for ATG for UE with omnidirectional antenna

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Value | Comment |
| Propagation condition | 1,2 |  | AWGN [220Hz] |  |
| 3 | AWGN [500Hz] |  |
| DRX | 1,2,3 |  | OFF | Only non-DRX tests apply |
| T2 | 1,2,3 | ms | [240] | The value applies for UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*] |
| T3 | 1,2,3 | s | [2] | The value applies for UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*] |

###### A.X.2.3.1.1.2 Test Requirements

For ATG UE with the one or multiple omni-directional antenna(s) [and ATG UE with the antenna array]

The test requirements of this test case are the same as those defined in clause A.6.3.2.1.1.2.

##### A.X.2.3.1.2 Inter-frequency RRC Re-establishment in FR1 with unknown target cell without serving cell timing for ATG

###### A.X.2.3.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 with unknown target cell and without serving cell timing are within the specified limits. These tests will verify the requirements in clause 6.2D.1.

The test parameters are given in table A.X.2.3.1.2.1-1, table A.X.2.3.1.2.1-2, table A.X.2.3.1.2.1-3 and table A.X.2.3.1.2.1-4 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

The 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.

Table A.X.2.3.1.2.1-1: Supported test configurations

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

Table A.X.2.3.1.2.1-2: 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 | 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 | FR1 PRACH configuration 1 | Table A.3.8.2.1-1 |
| 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 )  The value applies for UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*] |
| T3 | | s | 1, 2, 3 | [5] | The value applies for UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*] |

Table A.X.2.3.1.2.1-3: 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.2.1 TDD | | | TRS.2.1 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 confgiuration |  | 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, 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 | AWGN [220Hz] | | | | | |
|  | 3 | AWGN [500Hz] | | | | | |
| 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. | | | | | | | | |

###### A.X.2.3.1.2.2 Test Requirements

For UEs that don’t support *antennaArrayType-r18* [and UEs that support *antennaArrayType-18*]:

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 without serving cell timing shall be less than 3s.

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.

#### A.X.2.3.2 Random Access for ATG UE

A.X.2.3.2.1 4-step RA type contention based random access test in FR1 for NR standalone

###### A.X.2.3.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2D.2.2 and Clause 7.1D.2 in an AWGN with constant residual doppler model.

For this test one cell is used and configured as PCell in FR1. Supported test configurations are shown in Table A.X.2.3.2.1.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.1.1-2, except those described in the Table A.X.2.3.2.1.1-2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.2.3.2.1.1-1: Supported test configurations for contention based random access test in FR1 for NR standalone**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, |
| 2 | 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 depending on UE capability | |

**Table A.X.2.3.2.1.1-2: General test parameters for contention based random access test in FR1 for NR Standalone**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Test configuration | Unit | Test 1 | Comments |
| Propagation Condition | Config 1 | - | AWGN+220Hz |  |
| Config 2 | - | AWGN+500Hz |  |

###### A.X.2.3.2.1.2 Test Requirements

The test requirements defined in clause A.6.3.2.2.1.2 shall apply for ATG.

A.X.2.3.2.2 4-step RA type non-contention based random access test in FR1 for NR standalone

###### A.X.2.3.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2D.2.2 and Clause 7.1D.2 in an AWGN with constant residual doppler model.

For this test one cell is used and configured as PCell in FR1. Supported test configurations are shown in Table A.X.2.3.2.2.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2), except those described in the Table A.X.2.3.2.2.1-2. Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.2.3.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for NR standalone**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 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 depending on UE capability | |

**Table A.X.2.3.2.2.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Test configuration | Unit | Test 1 | Test 2 | Comments |
| Propagation Condition | Config 1 | - | AWGN+220Hz | AWGN+220Hz |  |
| Config 2 | - | AWGN+500Hz | AWGN+500Hz |  |

###### A.X.2.3.2.2.2 Test Requirements

The test requirements defined in clause A.6.3.2.2.2.2 shall apply for ATG.

A.X.2.3.2.3 2-step RA type contention based random access test in FR1 for NR standalone

###### A.X.2.3.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2D.2.3 and Clause 7.1D.2 in an AWGN with constant residual doppler model.

For this test one cell is used and configured as PCell in FR1. Supported test configurations are shown in Table A.X.2.3.2.3.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.3.1-2, except those described in the Table A.X.2.3.2.3.1-2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.2.3.2.3.1-1: Supported test configurations for 2-step RA type contention based random access with successRAR test in FR1 for NR standalone**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 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 depending on UE capability | |

**Table A.X.2.3.2.3.1-2: General test parameters for 2-step RA type contention based random access with successRAR test in FR1 for NR standalone**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Test configuration | Unit | Test 1 | Comments |
| Propagation Condition | Config 1 | - | AWGN+220Hz |  |
| Config 2 | - | AWGN+500Hz |  |

###### A.X.2.3.2.3.2 Test Requirements

The test requirements defined in clause A.6.3.2.2.3.2 shall apply for ATG.

##### A.X.2.3.2.4 2-step RA type non-contention based test in FR1 for NR standalone

###### A.X.2.3.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2D.2.3 and Clause 7.1D.2 in an AWGN with constant residual doppler model.

For this test one cell is used and configured as PCell in FR1. Supported test configurations are shown in Table A.X.2.3.2.4.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table Table A.6.3.2.2.4.1-2 except those described in the Table A.X.2.3.2.4.1-2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.2.3.2.4.1-1: Supported test configurations for non-contention based random access test in FR1 for NR standalone

|  |  |
| --- | --- |
| Config | Description |
| 1 | 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 depending on UE capability | |

Table A.X.2.3.2.4.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Test configuration | Unit | Test 1 | Comments |
| Propagation Condition | Config 1 | - | AWGN+220Hz |  |
| Config 2 | - | AWGN+500Hz |  |

###### A.X.2.3.2.4.2 Test Requirements

The test requirements defined in clause A.6.3.2.2.4.2 shall apply for ATG.

A.X.2.3.3 SA: RRC Connection Release with Redirection for ATG UE

A.X.2.3.3.1 Redirection from NR in FR1 to NR in FR1

###### A.X.2.3.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2D.3.2.1.

###### A.X.2.3.3.1.2 Test Parameters

Supported test configurations are shown in table A.X.2.3.3.1.2-1. The time delay is tested by using the parameters in Table A.6. 3.2.3.1.2-2 and Table A.6. 3.2.3.1.2-3, except those described in the tables A.X.2.3.3.1.2-2 and A.X.2.3.3.1.2-3.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

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.

**Table A.X.2.3.3.1.2-1: Redirection from NR to NR 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 | |

**Table A.X.2.3.3.1.2-2: General test parameters for** **Redirection from NR to NR test case**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Access Barring Information | - | not barred | No additional delays in random access procedure. |
| T2 | s | [2.3] | The value applies for UEs that don’t support antennaArrayType-r18 [and UEs that support antennaArrayType-18] |

**Table A.X.2.3.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| Propagation condition | Config 1, 2 | - | AWGN + 220Hz | | AWGN + 220Hz | |
|  | Config 3 |  | AWGN + 500Hz | | AWGN + 500Hz | |

###### A.X.2.3.3.1.3 Test Requirements

For UEs that don’t support *antennaArrayType-r1*8 [and UEs that support antennaArrayType-18]:

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 in the test.

Tidentify-NR = 680 ms in the test.

TSI-NR = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

TRACH = 170 ms in the test.

## A.X.3 Timing

### A.X.3.1 UE transmit timing

#### A.X.3.1.1 ATG UE Transmit Timing Test for FR1

##### A.X.3.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1D.2.

Supported test configurations refer to Table A.6.4.1.1.1-1.

A single NR cell is used during the test. Table A.X.3.1.1.1-1 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration SRSconfig.1 defined in Table A.6.4.1.1.1-3.

Changed UE location with the mobility assumption of 1200km/h, the specific UE location should be emulated by test system and provided to UE by AT command or GNSS simulator.

The specific gNB reference location is emulated by test system.

Table A.X.3.1.1.1-1: Cell Specific Test Parameters for UL Transmit Timing test

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Config | Test1 |
| SSB ARFCN |  | 1,2,3 | 1 |
| TDD configuration |  | 1 | Not Applicable |
|  |  | 2 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |
|  |  | 2 | 10: NRB,c = 52 |
|  |  | 3 | 40: NRB,c = 106 |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 |
| DRx Cycle | ms | 1,2,3 | N/A |
| 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 |
| OCNG Patterns |  | 1,2,3 | OP.1 |
|  |  |  |
| SSB configuration |  | 1,2 | SSB.1 FR1 |
|  |  | 3 | SSB.2 FR1 |
| SMTC Configuration |  | 1,2 | SMTC.1 |
|  |  | 3 | SMTC.2 |
| TRS configuration |  | 1 | TRS.1.1 FDD |
|  |  | 2 | TRS.1.1 TDD |
|  |  | 3 | TRS.1.2 TDD |
| 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 |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |
| Note2 | dBm/15 kHz | 1,2,3 | -98 |
| Note2 | dBm/SCS | 1,2 | -98 |
|  |  | 3 | -95 |
|  |  | 1,2,3 | 3 |
|  |  | 1,2,3 | 3 |
| SS-RSRPNote3 | dBm/SCS | 1,2 | -95 |
|  |  | 3 | -92 |
| IoNote3 | dBm/9.36MHz | 1,2 | -65.2 |
|  | dBm/38.1MHz | 3 | -59.2 |
| Propagation condition |  | 1,2 | AWGN + 2412HzNote6 |
|  |  | 3 | AWGN + 5556HzNote7 |
| SRS Config |  | 1,2 | SRSConf.1Note5 |
|  |  | 3 | SRSConf.1Note5 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: SRS configs are given in Table A.6.4.1.1.1-3  Note 6: 2412Hz is the maximum value of doppler with carrier frequency of 2170MHz. The specific doppler shift trajectory is up to test system’s design considering of BS location and UE GNSS emulation.  Note 7: 5556Hz is the maximum value of doppler with carrier frequency of 5GHz. The specific doppler shift trajectory is up to test system’s design considering of BS location and UE GNSS emulation. | | | |

##### A.X.3.1.1.2 Test requirements

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

Following will be the test sequence for this test

1) Setup NR PCell according to parameters given in Table A.X.3.1.1.1-1.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (NTA + NTA\_offset+) ×Tc ± Te\_ATG of the first detected path of DL SSB.

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

b. The Te\_ATG values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1D.2-1

c. The value is computed by the UE based on UE position and BS location.

3) The test system shall adjust the timing of the DL path by values given in Table A.X.3.1.1.2-1

Table A.X.3.1.1.2-1: Adjustment Value for DL Timing

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

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1D.2 Table 7.1D.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset+) ×Tc ± Te\_ATG respective to the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset+) ×Tc ± Te\_ATG of the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna.

### A.X.3.2 UE timer accuracy

### A.X.3.3 Timing advance

#### A.X.3.3.1 SA FR1 timing advance adjustment accuracy

##### A.X.3.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3D.

##### A.X.3.3.1.2 Test Parameters

Supported test configurations refer to table A.6.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.6.4.3.1.2-2, A.6.4.3.1.2-3 and A.6.4.3.1.2-4 except those defined in Table A.X.3.3.1.2-1.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.6.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.6.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3D.2.1, the UE adjusts its uplink timing at slot n+k*+2µ* for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

Changed UE location with the mobility assumption of 1200km/h, the specific UE location should be emulated by test system and provided to UE by AT command or GNSS simulator.

Table A.X.3.3.1.2-1 Cell specific test parameters for timing advance

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test1 | |
|  | |  | T1 | T2 |
| Propagation condition | Config 1 , 2 | - | AWGN + [220Hz] | |
|  | Config 3 |  | AWGN + [500Hz] | |
| Cell specific koffset |  |  | 3 | |

##### A.X.3.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. *k+1+2µ* slots after the reception of the timing advance command, where k=5.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3D.2.2.

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

## A.X.4 Signalling characteristics

### A.X.4.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means uplink signal

- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means no uplink signal.

#### A.X.4.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.X.4.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1D.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.X.4.1.1.1-1. The test parameters are given in Tables A.X.4.1.1.1-2, A.X.4.1.1.1-3, and A.X.4.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.X.4.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.1.1.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.X.4.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | FDD |
|  | | Config 2, 3 |  | TDD |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 |
|  | | Config 2 |  | 10: NRB,c = 52 |
|  | | Config 3 |  | 40: NRB,c = 106 |
| DL initial BWP configuration | | Config 1, 2, 3 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | Not Applicable |
|  | | Config 2 |  | TDDConf.1.1 |
|  | | Config 3 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD |
|  | | Config 2 |  | CR.1.1 TDD |
|  | | Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.3 FDD |
|  | | Config 2 |  | CCR.1.3 TDD |
|  | | Config 3 |  | CCR.2.2 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 |
|  | | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
|  | | Config 3 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 15 kHz |
|  | | Config 3 |  | 30 kHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.2.1-1 |
|  | | Config 3 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | *gp0* |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1 |  | CSI-RS.1.1 FDD |
|  | | Config 2 |  | CSI-RS.1.1 TDD |
|  | | Config 3 |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD |
|  | | Config 2 |  | TRS.1.1 TDD |
|  | | Config 3 |  | TRS.1.2 TDD |
| T1 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.2 |
| T1 for UE with the antennas array | | | s | 0.2 |
| T2 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.48 |
| T2 for UE with the antennas array | | | s | 1.28 |
| T3 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.48 |
| T3 for UE with the antennas array | | | s | 1.28 |
| D1 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.44 |
| D1 for UE with the antennas array | | | s | 1.24 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.X.4.1.1.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1 | dB | 1 | -7 | -15 |
|  | Config 2 |  | 1 | -7 | -15 |
|  | Config 3 |  | 1 | -7 | -15 |
|  | Config 1 | dBm/15kHz | -98 | | |
|  | Config 2 |  | -98 | | |
|  | Config 3 |  | -98 | | |
|  | Config 1 | dBm/SCS | -98 | | |
|  | Config 2 |  | -98 | | |
|  | Config 3 |  | -95 | | |
| Propagation condition | Config 1, 2 |  | AWGN+220 Hz | | |
| Config 3 |  | AWGN+500 Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.X.4.1.1.1-1.  Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. | | | | | |

Table A.X.4.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
|  | Value |
| gapOffset | 0 |
| Note: Ensure that RLM RS is partially overlapped with measurement gap | |

****

**Figure A.X.4.1.1.1-1: SNR variation for out-of-sync testing**

##### A.X.4.1.1.2 Test Requirements

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

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

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

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

#### A.X.4.1.2 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.X.4.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1D.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.X.4.1.2.1-1. The test parameters are given in Tables A.X.4.1.2.1-2, and A.X.4.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.X.4.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.1.2.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

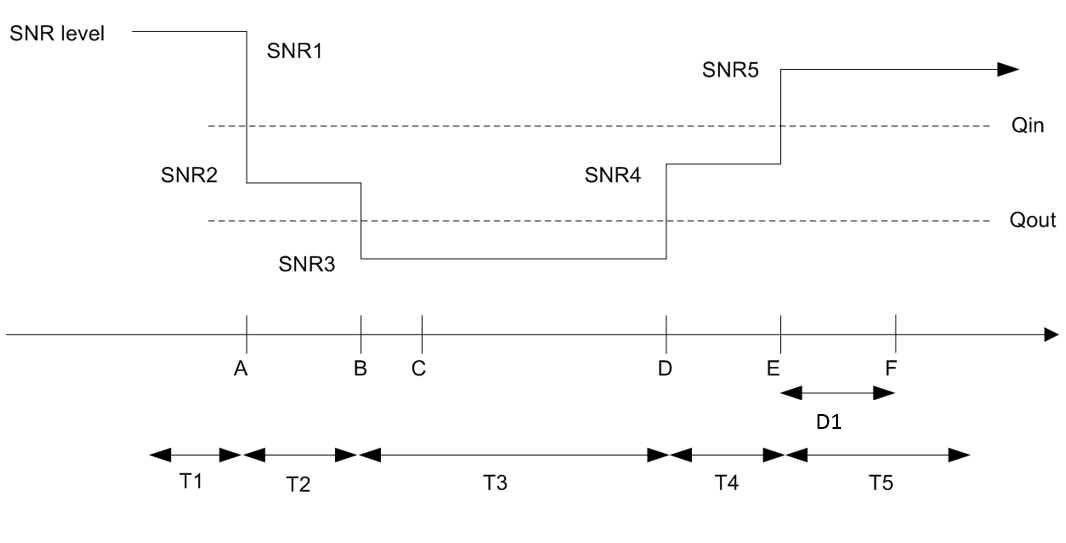
Table A.X.4.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | FDD |
|  | | Config 2, 3 |  | TDD |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 |
|  | | Config 2 |  | 10: NRB,c = 52 |
|  | | Config 3 |  | 40: NRB,c = 106 |
| DL initial BWP configuration | | Config 1, 2, 3 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | Not Applicable |
|  | | Config 2 |  | TDDConf.1.1 |
|  | | Config 3 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD |
|  | | Config 2 |  | CR.1.1 TDD |
|  | | Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.1 FDD |
|  | | Config 2 |  | CCR.1.1 TDD |
|  | | Config 3 |  | CCR.2.1 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 |
|  | | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
|  | | Config 3 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 15 kHz |
|  | | Config 3 |  | 30 kHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.2.1-1 |
|  | | Config 3 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| In sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 1000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | |  | CSI-RS.1.1 FDD |
|  | Config 2 | |  | CSI-RS.1.1 TDD |
|  | Config 3 | |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | |  | TRS.1.1 FDD |
|  | Config 2, 5 | |  | TRS.1.1 TDD |
|  | Config 3, 6 | |  | TRS.1.2 TDD |
| T1 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.2 |
| T1 for UE with the antennas array | | | s | 0.2 |
| T2 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.2 |
| T2 for UE with the antennas array | | | s | 0.4 |
| T3 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.24 |
| T3 for UE with the antennas array | | | s | 0.44 |
| T4 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.2 |
| T4 for UE with the antennas array | | | s | 0.2 |
| T5 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.88 |
| T5 for UE with the antennas array | | | s | 0.88 |
| D1 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.84 |
| D1 for UE with the antennas array | | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.X.4.1.2.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 2 |  | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 3 |  | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1 | dBm/15 kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -98 | | | | |
|  | Config 1 | dBm/SCS | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -95 | | | | |
| Propagation condition | Config 1, 2 |  | AWGN +220 Hz | | | | |
| Config 3 |  | AWGN +500 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.X.4.1.2.1-1.  Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6. | | | | | | | |

**Table A.X.4.1.2.1-4: Void**

****

**Figure A.X.4.1.2.1-1: SNR variation for in-sync testing**

##### A.X.4.1.2.2 Test Requirements

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

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

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

#### A.X.4.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

##### A.X.4.1.3.1 Test Purpose and Environment

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

The test parameters are given in Tables A.X.4.1.3.1-1, A.X.4.1.3.1-2, A.X.4.1.3.1-3, and A.X.4.1.3.1-3A below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.X.4.1.3.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 is configured as the BFD-RS.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.1.3.1-1: Supported test configurations for FR1 PCell

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

Table A.X.4.1.3.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Duplex mode | Config 1 |  | FDD |
|  | Config 2, 3 |  | TDD |
| TDD Configuration | Config 1 |  | Not Applicable |
|  | Config 2 |  | TDDConf.1.1 |
|  | Config 3 |  | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
|  | Config 2 |  | CR.1.1 TDD |
|  | Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.3 FDD |
|  | Config 2 |  | CCR.1.3 TDD |
|  | Config 3 |  | CCR.2.2 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR1 |
|  | Config 2 |  | SSB.1 FR1 |
|  | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
|  | Config 3 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
|  | Config 3 |  | 30 kHz |
| TRS configuration | Config 1 |  | TRS.1.1 FDD |
|  | Config 2 |  | TRS.1.1 TDD |
|  | Config 3 |  | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.1.1 FDD |
|  | Config 2 |  | Resource #4 in TRS.1.1 TDD |
|  | Config 3 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | *gp0* |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD |
|  | Config 2 |  | CSI-RS.1.1 TDD |
|  | Config 3 |  | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.X.4.1.3.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1 | dB | 1 | -7 | -15 |
|  | Config 2 |  | 1 | -7 | -15 |
|  | Config 3 |  | 1 | -7 | -15 |
|  | Config 1 | dBm/15kHz | -98 | | |
|  | Config 2 |  | -98 | | |
|  | Config 3 |  | -98 | | |
| Propagation condition | Config 1, 2 |  | AWGN +220 Hz | | |
| Config 3 |  | AWGN +500 Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.X.4.1.3.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6]. | | | | | |

Table A.X.4.1.3.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |
| Note 1: Void | |

Table A.X.4.1.3.1-4: Void

****

Figure A.X.4.1.3.1-1: SNR variation for CSI-RS out-of-sync testing

##### A.X.4.1.3.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C (D1 ms after the start of the time duration T3) on the PCell.

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

#### A.X.4.1.4 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

##### A.X.4.1.4.1 Test Purpose and Environment

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

The test parameters are given in Tables A.X.4.1.4.1-1, A.X.4.1.4.1-2, and A.X.4.1.4.1-3 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.X.4.1.4.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.1.4.1-1: Supported test configurations for FR1 PCell

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

Table A.X.4.1.4.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| 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 |
| DL initial BWP configuration | Config 1, 2, 3 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
|  | Config 2 |  | CR.1.1 TDD |
|  | Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
|  | Config 2 |  | CCR.1.1 TDD |
|  | Config 3 |  | CCR.2.1 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR1 |
|  | Config 2 |  | SSB.1 FR1 |
|  | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
|  | Config 3 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
|  | Config 3 |  | 30 kHz |
| TRS configuration | Config 1 |  | TRS.1.1 FDD |
|  | Config 2 |  | TRS.1.1 TDD |
|  | Config 3 |  | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.1.1 FDD |
|  | Config 2 |  | Resource #4 in TRS.1.1 TDD |
|  | Config 3 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS 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 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| T6 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.X.4.1.4.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 2 |  | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 3 |  | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1 | dBm/15kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -98 | | | | |
| Propagation condition | Config 1, 2 |  | AWGN +220 Hz | | | | |
| Config 3 |  | AWGN +500 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.X.4.1.4.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1. | | | | | | | |

Table A.X.4.1.4.1-4: Void

****

Figure A.X.4.1.4.1-1: SNR variation for CSI-RS in-sync testing

##### A.X.4.1.4.2 Test Requirements

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

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

### A.X.4.2 Beam Failure Detection and Link recovery procedures

#### A.X.4.2.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.X.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5D.

The test parameters are given in Tables A.X.4.2.1.1-1, A.X.4.2.1.1-2, A.X.4.2.1.1-3 and A.X.4.2.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.X.4.2.1.1-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure A.X.4.2.1.1-2 shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.2.1.1-1: Supported test configurations for FR1 PCell

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

Table A.X.4.2.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| Active PSCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Duplex mode | | Config 1 |  | FDD |  |
|  | | Config 2, 3 |  | TDD |  |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 |  |
|  | | Config 2 |  | 10: NRB,c = 52 |  |
|  | | Config 3 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | Config 1, 2, 3 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1, 2, 3 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1, 2, 3 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1, 2, 3 |  | ULBWP.1.1 |  |
| TDD Configuration | | Config 1 |  | Not Applicable |  |
|  | | Config 2 |  | TDDConf.1.1 |  |
|  | | Config 3 |  | TDDConf.2.1 |  |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD |  |
|  | | Config 2 |  | CR.1.1 TDD |  |
|  | | Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.1 FDD |  |
|  | | Config 2 |  | CCR.1.1 TDD |  |
|  | | Config 3 |  | CCR.2.1 TDD |  |
| SSB Configuration | | Config 1 |  | SSB.3 FR1 |  |
|  | | Config 2 |  | SSB.3 FR1 |  |
|  | | Config 3 |  | SSB.4 FR1 |  |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |  |
|  | | Config 3 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 15 KHz |  |
|  | | Config 3 |  | 30 KHz |  |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.2.2-1 |  |
|  | | Config 3 |  | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | |  | 1 |  |
| OCNG parameters | | |  | OP.1 |  |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | DCI format | |  | 1-0 |  |
|  | Number of Control OFDM symbols | |  | 2 |  |
|  | Aggregation level | | CCE | 8 |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |  |
|  | DMRS precoder granularity | |  | REG bundle size |  |
|  | REG bundle size | |  | 6 |  |
| DRX | | |  | OFF |  |
| Gap pattern ID | | |  | gp0 |  |
| gapOffset | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  | Config 3 | |  | -95 |  |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer | | |  | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| 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 |  |
| CSI-RS for tracking | Config 1 | |  | TRS.1.1 FDD |  |
|  | Config 2 | |  | TRS.1.1 TDD |  |
|  | Config 3 | |  | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS |  | |  | 0, 1 |  |
| T310 Timer |  | | ms | 1000 |  |
| N310 |  | |  | 2 |  |
| T1 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.2 | During this time the the UE shall be fully synchronized to cell 1 |
| T1 for UE with the antennas array | | | s | 0.2 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.37 |  |
| T2 for UE with the antennas array | | | s | 0.37 |  |
| T3 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.24 |  |
| T3 for UE with the antennas array | | | s | 0.68 |  |
| T4 for UE with one or multiple omnidirectional antenna(s) | | | s | 0 |  |
| T4 for UE with the antennas array | | | s | 0 |  |
| T5 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.17 |  |
| T5 for UE with the antennas array | | | s | 0.41 |  |
| D1 for UE with one or multiple omnidirectional antenna(s) | | | s | 0.13 |  |
| D1 for UE with the antennas array | | | s | 0.37 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

Table A.X.4.2.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3 |  | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 2 |  | -108 | -108 | -88 | -88 | -88 |
|  | Config 3 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 KHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -98 | | | | |
| Propagation condition | Config 1, 2 |  | AWGN +220 Hz | | | | |
| Config 3 |  | AWGN +500 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6. | | | | | | | |

**Table A.X.4.2.1.1-4: Void**

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Figure A.X.4.2.1.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

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Figure A.X.4.2.1.1-2: L1-RSRP level variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

A.X.4.2.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.X.4.2.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.X.4.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5D.

The test parameters are given in Tables A.X.4.2.2.1-1, A.X.4.2.2.1-2, and below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.X.4.2.2.1-1 shows the variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure. Figure A.X.4.2.2.1-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.2.2.1-1: Supported test configurations for FR1 PCell

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

Table A.X.4.2.2.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Value | Comment |
|  | | | |  | Test 1 |  |
| Active PCell | | | |  | Cell 1 |  |
| 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 |  |
| RMSI CORESET Reference Channel | Config 1 | | |  | CR.1.1 FDD | A.3.1.2 |
|  | Config 2 | | |  | CR.1.1 TDD |  |
|  | Config 3 | | |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | Config 1 | | |  | CCR.1.1 FDD | A.3.1.3 |
|  | Config 2 | | |  | CCR.1.1 TDD |  |
|  | Config 3 | | |  | CCR.2.1 TDD |  |
| SSB Configuration | Config 1 | | |  | SSB.3 FR1 | A.3.10 |
| Config 2 | | |  | SSB.3 FR1 |
| Config 3 | | |  | SSB.4 FR1 |
| SSB Configuration | Config 1 | | |  | SSB. 3 FR1 | A.3.10 |
|  | Config 2 | | |  | SSB. 3 FR1 |  |
|  | Config 3 | | |  | SSB. 4 FR1 |  |
| SMTC Configuration | Config 1, 2 | | |  | SMTC.1 | A.3.11 |
|  | Config 3 | | |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | |  | 15 KHz |  |
|  | Config 3 | | |  | 30 KHz |  |
| PRACH  Configuration | Config 1, 2 | | |  | FR1 PRACH configuration 4 | A.3.8.2 |
| Config 3 | | |  | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set q0 | | | |  | 0 |  |
| OCNG parameters | | | |  | OP.1 | A.3.2.1 |
| CP length | | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | DCI format | | |  | 1-0 |  |
|  | Number of Control OFDM symbols | | |  | 2 |  |
|  | Aggregation level | | | CCE | 8 |  |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 |  |
|  | DMRS precoder granularity | | |  | REG bundle size |  |
|  | REG bundle size | | |  | 6 |  |
| DRX | | | |  | OFF |  |
| Gap pattern ID | | | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | | | |  | 1 | N |
| rlmInSyncOutOfSyncThreshold | | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdCSI-RS | | Config 1, 2 | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_CSI-RS |
|  | | Config 3 | |  | -95 |  |
| powerControlOffsetSS | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | |  | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer | | | |  | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| CSI-RS configuration for q0 and q1 | | | Config 1 |  | CSI-RS.1.2 FDD | A.3.14 |
|  | | | Config 2 | CSI-RS.1.2 TDD |  |
|  | | | Config 3 | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for CSI reporting | | | Config 1 |  | CSI-RS.1.1 FDD | A.3.14 |
|  | | | Config 2 |  | CSI-RS.1.1 TDD |  |
|  | | | Config 3 |  | CSI-RS.2.1 TDD |  |
| TRS configuration | | | Config 1 |  | TRS.1.1 FDD |  |
|  | | | Config 2 |  | TRS.1.1 TDD |  |
|  | | | Config 3 |  | TRS.1.2 TDD |  |
| CSI-RS-Index assigned as RLM RS | | | Config 1 |  | CSI-RS.1.2 FDD | A.3.14 |
|  | | | Config 2 |  | CSI-RS.1.2 TDD |  |
|  | | | Config 3 |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | | | ms | 1000 |  |
| N310 | | | |  | 2 |  |
| T1 | | | | s | 0.2 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 0.18 |  |
| T3 | | | | s | 0.14 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 0.08 |  |
| D1 | | | | s | 0.04 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | |

Table A.X.4.2.2.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3 |  | -10 | -10 | 10 | 10 | 10 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 2 |  | -108 | -108 | -88 | -88 | -88 |
|  | Config 3 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 KHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -98 | | | | |
| Propagation condition | Config 1, 2 |  | AWGN +220 Hz | | | | |
| Config 3 |  | AWGN +500 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6. | | | | | | | |

Table A.X.4.2.2.1-4: Void

Table A.X.4.2.2.1-5: Void

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Figure A.X.4.2.2.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

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Figure A.X.4.2.2.1-2: L1-RSRP level variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

##### A.X.4.2.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 30+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.X.4.3 Active BWP switch

#### A.X.4.3.1 DCI-based and Timer-based Active BWP Switch

##### A.X.4.3.1.1 NR FR1 DL active BWP switch with non-DRX in SA

A.X.4.3.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6D.

The supported test configurations are shown in Table A.X.4.3.1.1.1-1. The test scenario comprises of one cell (Cell 1) as given in Table A.X.4.3.1.1.1-2. Cell-specific parameters of the cell are specified in Table A.X.4.3.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.

- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1.

- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

The cell has constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1’s slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1’s DL slot (*i+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 no later than the first UL slot that occurs after the beginning of slot (*i+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on Cell1’s BWP-2 starting from the first DL slot that occurs after the beginning of slot (*i+TBWPswitchDelay*).

During T2, the test equipment won’t transmit DCI format for PDSCH reception on Cell1.

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1’s slot (*j+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 at latest on the first UL slot that occurs after the beginning of slot (*j+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on Cell1’s BWP-1 starting from the first DL slot that occurs after the beginning of slot (*j+TBWPswitchDelay*).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.3.1.1.1-1: DL BWP switch supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.  Note 2: A UE which fulfils the requirements in test case A.X.4.3.1.1 can skip the test cases in A.X.4.3.1.1. | |

Table A.X.4.3.1.1.1-2: General test parameters for DL BWP switch in SA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active Cell |  | Cell 1 | Cell1 on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| *bwp-InactivityTimer* | ms | 200 |  |
| PDCCH and PDSCH maximum number of HARQ transmission |  | 1 |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

Table A.X.4.3.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 |
| Frequency Range | | |  | FR1 |
| 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 |  | 10 MHz: NRB,c = 52 |
|  | | Config 2 |  | 10 MHz: NRB,c = 52 |
|  | | Config 3 |  | 40 MHz: NRB,c = 106 |
| Active BWP ID | | |  | 1, 2 |
| Initial DL BWP Configuration | | Config 1,2,3 |  | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | | Config 1,2,3 |  | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | | Config 1,2,3 |  | DLBWP.1.3 Note 4 |
| Initial UL BWP Configuration | | Config 1,2,3 |  | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | | Config 1,2,3 |  | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | | Config 1 |  | N/A |
|  | | Config 2,3 |  | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD |
|  | | Config 2 | SR.1.1 TDD |
|  | | Config 3 | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1 |  | CR.1.1 FDD |
|  | | Config 2 | CR.1.1 TDD |
|  | | Config 3 | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1 |  | CCR.1.2 FDD |
|  | | Config 2 | CCR.1.2 TDD |
|  | | Config 3 | CCR.2.4 TDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 |
|  | | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | |  |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | |  | 1x2 Low |
| TRS Configuration | | Config 1,4 |  | TRS.1.1 FDD |
|  | | Config 2,5 |  | TRS.1.1 TDD |
|  | | Config 3,6 |  | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |
| NocNote 2 | Config 1,2 | | dBm/SCS | -104 |
|  | Config 3 | |  | -101 |
| NocNote 2 | | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2 | | dBm/SCS | -87 |
|  | Config 3 | |  | -84 |
| Ês/Iot | | | dB | 17 |
| Ês/Noc | | | dB | 17 |
| IoNote3 | | Config 1,2 | dBm/  9.36MHz | -58.96 |
|  | | Config 3 | dBm/  38.16MHz | -52.86 |
| Propagation condition | | Config 1, 2 |  | AWGN +220 Hz |
| Config 3 |  | AWGN +500 Hz |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | | | |

A.X.4.3.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (*i+TBWPswitchDelay*+*k1*).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (*j+TBWPswitchDelay*+*k1*).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration *TBWPswitchDelay* defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed Cell1 active BWP switch delay to be counted as correct.

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

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot (*i+TBWPswitchDelay*+*k1*), (*j+TBWPswitchDelay*+*k1*), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.X.4.3.2 RRC-based Active BWP Switch

##### A.X.4.3.2.1 NR FR1 DL active BWP switch of Cell with non-DRX in SA

A.X.4.3.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6D.

The supported test configurations are shown in Table A.X.4.3.2.1.1-1. The test scenario comprises of one Cell (Cell 1) as given in Table A.X.4.3.2.1.1-2. Cell-specific parameters of Cell are specified in Table A.X.4.3.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 of initial condition in Cell 1.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell’s slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot as defined in clause 8.6.3 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot on BWP-1 of final condition. The UE shall be continuously scheduled on PCell’s BWP-1 of final condition starting from the first DL slot right after slot .

TRRCprocessingDelay and TBWPswitchDelayRRC are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a vaild ACK/NACK is received is received.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.3.2.1.1-1: DL BWP switch supported test configurations in SA scenario

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

Table A.X.4.3.2.1.1-2: General test parameters for DL BWP switch in SA scenario

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active Cell |  | Cell 1 | Cell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| PDCCH and PDSCH maximum number of HARQ transmission |  | 1 |  |
| T1 | s | 0.2 |  |

Table A.X.4.3.2.1.1-3: NR Cell specific test parameters for DL BWP switch in SA scenario

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 |
| Frequency Range | | |  | FR1 |
| 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 |  | 10 MHz: NRB,c = 52 |
|  | | Config 2 |  | 10 MHz: NRB,c = 52 |
|  | | Config 3 |  | 40 MHz: NRB,c = 106 |
| Active BWP ID | | |  | 1 |
| Initial DL BWP Configuration | | Config 1,2, 3 |  | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1,2, 3 |  | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1, 2, 3 |  | DLBWP.1.3 |
|  | Active UL BWP-1 Configuration | Config 1, 2, 3 |  | ULBWP.1.3 |
| Final  Condition | Active DL BWP-1 Configuration | Config 1, 2, 3 |  | DLBWP.1.1 |
|  | Active UL BWP-1 Configuration | Config 1, 2, 3 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD |
|  | | Config 2 |  | SR.1.1 TDD |
|  | | Config 3 |  | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1 |  | CR.1.1 FDD |
|  | | Config 2 |  | CR.1.1 TDD |
|  | | Config 3 |  | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1 |  | CCR.1.2 FDD |
|  | | Config 2 |  | CCR.1.2 TDD |
|  | | Config 3 |  | CCR.2.4 TDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 |
|  | | Config 3 | SSB.2 FR1 |
| SMTC Configuration | | |  | SMTC.1 |
| TRS Configuration | | Config 1 |  | TRS.1.1 FDD |
|  | | Config 2 |  | TRS.1.1 TDD |
|  | | Config 3 |  | TRS.1.2 TDD |
| Propagation condition | | Config 1, 2 |  | AWGN +220 Hz |
| Config 3 |  | AWGN +500 Hz |
| Antenna Configuration | | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | |  |  |
| NocNote 2 | | Config 1,2 | dBm/SCS | -104 |
|  | | Config 3 |  | -101 |
| SS-RSRP Note 3 | | Config 1,2 | dBm/SCS | -87 |
|  | | Config 3 |  | -84 |
| Ês/Iot | | | dB | 17 |
| Ês/Noc | | | dB | 17 |
| IoNote3 | | Config 1,2 | dBm/  9.36MHz | -58.96 |
|  | | Config 3 | dBm/  38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | | | |

A.X.4.3.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the begining of slot and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

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

### A.X.4.4 UE specific CBW change

#### A.X.4.4.1 UE specific CBW change on PCell in FR1 in non-DRX

##### A.X.4.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13D.

The supported test configurations are shown in Table A.X.4.4.1.1-1. The test scenario comprises of one Cell (Cell 1), which is PCell as given in Table A.X.4.4.1.1-2. Cell-specific parameters are specified in Table A.X.4.4.1.1-3.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE sends ACK/NACK during the test.

Before the test starts:

* UE is connected to Cell 1 (PCell) on radio channel 1.
* UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
* UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 of initial condition in PCell.
* UE has been configured with UE specific CBW (CBW-1).
* UE is indicated in *SCS-SpecificCarrier* [2] that the UE specific CBW is CBW-1 as the initial condition in Cell 1 (PCell).

Cell1 (PCell) has constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* containing *SCS-SpecificCarrier* with updated UE specific CBW, sent from the test equipment to the UE, is completely received at the UE side in PCell’s slot # denoted *i*. The UE shall reconfigure its UE specific CBW with the updated CBW-2 for the final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot as defined in clause 8.13 and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot on the PCell’s BWP-1 on CBW-2 for the final condition. The UE shall be continuously scheduled on the PCell’s BWP-1 on CBW-2 for the final condition starting from the first DL slot right after slot .

and are defined in clause 8.13.

The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the RRC Reconfiguration message including updated UE specific CBW configuration is sent until the moment a vaild ACK/NACK is received.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.4.1.1-1: Supported test configurations for UE specific CBW change in SA scenario

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

Table A.X.4.4.1.1-2: General test parameters for UE specific CBW change in SA scenario

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active Cell |  | Cell 1 | Cell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |

Table A.X.4.4.1.1-3: NR Cell specific test parameters for UE specific CBW change in SA scenario

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Cell 1 |
| Frequency Range | | | |  | FR1 |
| 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 | |  | 10 MHz: NRB,c = 52 |
| Config 2 | | 10 MHz: NRB,c = 52 |
| Config 3 | | 40 MHz: NRB,c = 106 |
| Active DL BWP ID | | Config 1,2, 3 | |  | 1 |
| Initial DL BWP Configuration (BWP-1) | | Config 1,2, 3 | |  | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1,2, 3 | |  | ULBWP.0.2 |
| Initial Condition | Active DLCBW-1 Configureation | Config 1, 2, 3 | |  | DLCBW.1.1 |
|  | Active UL  CBW-1  Configuration | Config 1, 2, 3 | |  | ULCBW.1.1 |
| Final Condition | Active DLCBW-1 Configureation | Config 1, 2, 3 | |  | DLCBW.1.2 |
|  | Active UL  CBW-1  Configuration | Config 1, 2, 3 | |  | ULCBW.1.2 |
| PDSCH Reference measurement channel | | Config 1 | |  | SR.1.1 FDD |
| Config 2 | | SR.1.1 TDD |
| Config 3 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1 | |  | CR.1.1 FDD |
| Config 2 | | CR.1.1 TDD |
| Config 3 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1 | |  | CCR.1.1 FDD |
| Config 2 | | CCR.1.1 TDD |
| Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | |  | OP.1 |
| SSB Configuration | | Config 1,2 | |  | SSB.1 FR1 |
| Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | |  | SMTC.1 |
| TRS Configuration | | | Config 1 |  | TRS.1.1 FDD |
| Config 2 |  | TRS.1.1 TDD |
| Config 3 |  | TRS.1.2 TDD |
| Propagation condition | | | Config 1, 2 |  | AWGN +220 Hz |
| Config 3 |  | AWGN +500 Hz |
| Antenna Configuration | | | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | |
| NocNote 2 | | Config 1,2 | | dBm/SCS | -104 |
| Config 3 | | -101 |
| SS-RSRP Note 3 | | Config 1,2 | | dBm/SCS | -87 |
| Config 3 | | -84 |
| Ês/Iot | | | | dB | 17 |
| Ês/Noc | | | | dB | 17 |
| IoNote3 | | Config 1,2 | | dBm/  9.36MHz | -58.96 |
| Config 3 | | dBm/  38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [3]. | | | | | |

##### A.X.4.4.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for the PCell from the first DL slot that occurs right after the begining of slot and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed UE specific CBW change delay on the PCell to be counted as correct.

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

### A.X.4.5 Pathloss reference signal switching delay

#### A.X.4.5.1 MAC-CE based pathloss reference signal switch delay

##### A.X.4.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the MAC-CE based pathloss reference signal switch delay requirement defined in clause 8.14D.

The supported test configurations are shown in Table A.X.4.5.1.1-1. The test scenario comprises of one cell (Cell 1) as given in Table A.X.4.5.1.1-2. Cell-specific parameters of the cell are specified in Table A.X.4.5.1.1-3 below.

The test consists of 3 successive time periods, with duration of T1, T2 and T3, respectively.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 on radio channel 1.

- UE shall be fully synchronized to SSB #0.

During T1,

- The UE shall track SSB #1 so that SSB #1 as a pathloss reference signal is known to the UE.

Time period T2 starts when the UE is configured of the power headroom reporting functionality by upper layers by the test equipment and the UE shall transmit a PHR during T2.

During T2,

- UE is configured with a *phr-ProhibitTimer* timer value for Cell 1.

- UE is configured with a *phr-Tx-PowerFactorChange* value for Cell 1.

During T3,

Time period T3 starts when a PDSCH carrying MAC-CE activation for pathloss reference signal switch, sent from the test equipment to the UE to swicth the pathloss reference signal from SSB 0 to SSB 1, is received at the UE side in Cell1’s slot # denoted *i*. The UE shall switch its pathloss reference signal to the target one and send PHR.

The UE shall be able to apply the target pathloss reference signal of the serving cell on which pathloss reference signal switch occurs no later than the slot *i* + + as defined in clause 8.14. The UE shall be able to apply old pathloss reference signals until the slot *i* + + as defined in clause 8.14.

The test equipment verifies the pathloss RS switch time by counting the slots from the time when the pathloss RS switch command is transmitted till a PHR is received during T3.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.4.5.1.1-1: MAC-CE based pathloss reference signal switch supported test configurations

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

Table A.X.4.5.1.1-2: General test parameters for MAC-CE based pathloss reference signal switch in SA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Active PCell | |  | Cell 1 |  |
| RF Channel Number | |  | 1 |  |
| Duplex mode | Config 1 |  | FDD |  |
| Config 2, 3 |  | TDD |  |
| DL initial BWP configuration | Config 1, 2, 3 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | Config 1, 2, 3 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | Config 1, 2, 3 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | Config 1, 2, 3 |  | ULBWP.1.1 |  |
| TDD Configuration | Config 1 |  | Not Applicable |  |
| Config 2 |  | TDDConf.1.1 |  |
| Config 3 |  | TDDConf.2.1 |  |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| SSB Configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |  |
| Config 3 |  | SSB.2 FR1 |  |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |  |
| Config 3 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |  |
| Config 3 |  | 30 kHz |  |
| SSB index assigned as pathloss RS | |  | 0 in T1, 0 in T2, 1 in T3 |  |
| OCNG parameters | |  | OP.1 |  |
| CP length | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |  |
| DRX | |  | OFF |  |
| Gap pattern ID | |  | gp0 |  |
| *phr-ProhibitTimer* | | sub frame | 0 |  |
| *phr-Tx-PowerFactorChange* | | dB | 5 |  |
| *phr-PeriodicTimer* | | sub frame | infinity |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| T1 | | s | [2] |  |
| T2 | | s | [2] |  |
| T3 | | s | 0.2 |  |

Table A.X.4.5.1.1-3: NR Cell specific test parameters for MAC-CE based pathloss reference signal switch in SA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Test 1 | | |
| T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | dB |
| EPRE ratio of PSS to SSS | | | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | dB |
| EPRE ratio of OCNG DMRS to SSS | | | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | | | dB |
| SSB with index 0 |  | | | dB | [7] | | |
|  | Config 1, 2, 3 | | dBm/15kHz | [-101] | | |
|  | | | dB | [7] | | |
| SS-RSRP Note 4 | | Config 1, 2 | dBm/ SCS | [-94] | | |
| Config 3 | [-91] | | |
| SSB with index 1 |  | | | dB | [-3] | | |
|  | Config 1, 2, 3 | | dBm/15kHz | [-101] | | |
|  | | | dB | [-3] | | |
| SS-RSRP Note 4 | | Config 1, 2 | dBm/ SCS | [-104] | | |
| Config 3 | [-101] | | |
| Io Note 5 | Config 1, 2 | | | dBm | -65.3/9.36MHz | | |
| Config 3 | | | -59.2/38.16MHz | | |
| Propagation condition | Config 1, 2 | | |  | AWGN +220 Hz | | |
| Config 3 | | |  | AWGN +500 Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 5: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. | | | | | | | |

##### A.X.4.5.1.2 Test Requirements

During T3, the UE shall start to send the PHR for PCell no later than the slot *i* + + .

During T3, the UE shall start to send the PHR for PCell no earlier than the slot *i* + + .

Where, is the timing between pathloss reference MAC-CE activation command and acknowledgement as specified in [7], is the periodicity of the target pathloss reference signal which is SSB in this test.

During T3, UE shall send L1-RSRP report with measurement results for both SSB0 and SSB1.

All of the above test requirements shall be fulfilled in order for the observed pathloss RS switch delay to be counted as correct.

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

Note: The UE shall be given proper uplink transmission grant during T2 and T3.

## A.X.5 Measurement procedure

### A.X.5.1 Intra-frequency Measurements

#### A.X.5.1.1 SA event triggered reporting tests without gap without SSB index reading under non-DRX

##### A.X.5.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2D.5.1 and 9.2D.5.2.

##### A.X.5.1.1.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test configurations are given in the Table A.X.5.1.1.2-1, the test parameters for PCell and neighbour cell refer to Table A.6.6.1.1.1.2-2 and A.6.6.1.1.1.2-3 except those described in the table A.X.5.1.1.2-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.5.1.1.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 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. | |

Table A.X.5.1.1.2-2: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1, 2 | AWGN+[220Hz] | | | |
|  |  | 3 | AWGN+[500Hz] | | | |

##### A.X.5.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [800] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.X.5.1.2 SA event triggered reporting tests with per-UE gaps under non-DRX

##### A.X.5.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2D.6.2 and 9.2D.6.3.

##### A.X.5.1.2.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test configuration refer to Table A.6.6.1.3.2-1, the test parameters refer to Table A.6.6.1.3.2-2 and A.6.6.1.3.2-3, except those described in the table A.X.5.1.2.2-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.5.1.2.2-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1, 2 | AWGN+[220Hz] | | | |
|  |  | 3 | AWGN+[500Hz] | | | |

##### A.X.5.1.2.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [800] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.X.5.1.3 SA event triggered reporting tests without gap under non-DRX with SSB index reading

##### A.X.5.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2D.5.1 and 9.2D.5.2.

##### A.X.5.1.3.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test configuration refer to Table A.6.6.1.5.2-1, the test parameters for FDD PCell and neighbour cell refer to Table A.6.6.1.5.2-2 and A.6.6.1.5.2-3 except those described in the table A.X.5.1.3.2-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.5.1.3.2-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1 | AWGN+[220Hz] | | | |

##### A.X.5.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [920] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.X.5.1.4 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading

##### A.X.5.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2D.6.2 and 9.2D.6.3.

##### A.X.5.1.4.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test configuration refer to Table A.6.6.1.6.2-1, the test parameters refer to Table A.6.6.1.6.2-2 and A.6.6.1.6.2-3 except those described in the table A.X.5.1.4.2-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.5.1.4.2-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1 | AWGN+[220Hz] | | | |

##### A.X.5.1.4.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [920] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.X.5.2 Inter-frequency Measurements

A.X.5.2.1 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is used

A.X.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3D.4.

##### A.X.5.2.1.2 Test parameters

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test configuration refer to Table A.6.6.1.3.2-1. The general test parameters are given in Table A.X.5.2.1.2-1. The cell specific test parameters refer to A.6.6.2.2.1-3, except those described in the table A.X.5.2.1.2-2.The DRX configuration is given in Table A.X.5.2.1.2-3. The *TimeAlignmentTimer* configuration refers to Table A.6.6.2.2.1-5.

Measurement gap pattern configuration defined in Table A.X.5.2.1.2-1 is per-UE gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.5.2.1.2-1: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 9 | |  |
| A3-Offset | dB | Config 1,2,3 | -6 | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | |  |
| CP length |  | Config 1,2,3 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | DRX.1 | DRX. 7 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |  | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 1.1 | 11 |  |

Table A.X.5.2.1.2-2: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1, 2 | AWGN+[220Hz] | | | |
|  |  | 3 | AWGN+[500Hz] | | | |

Table A.X.5.2.1.2-3: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |
| --- | --- | --- | --- |
| Field | Test1 | Test2 | Comment |
|  | Value | Value |  |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer | ms1 | ms1 |  |
| drx-RetransmissionTimerDL | sl1 | sl1 |  |
| drx-RetransmissionTimerUL | sl1 | sl1 |  |
| drx-LongCycleStartOffset | ms40 | Ms640 |  |
| shortDRX | disable | disable |  |

A.X.5.2.1.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1080] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [10240] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.X.5.2.2 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

A.X.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3D.4 and 9.3D.5.

##### A.X.5.2.2.2 Test parameters

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test configurations refer to Tables A.6.6.2.5.1-1. The test parameters refer to Table A.6.6.2.5.1-2 and A.6.6.2.5.1-3 except those described in Table A.X.5.2.2.2-1.

Measurement gap pattern configuration defined in Table A.6.6.2.5.1-2 is per-UE gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.5.2.2.2-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1, 2 | AWGN+[220Hz] | | | |
|  |  | 3 | AWGN+[500Hz] | | | |

A.X.5.2.2.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1040] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.X.5.2.3 SA event triggered reporting tests for FR1 without gap when DRX is not used

A.X.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3D.9.

##### A.X.5.2.3.2 Test parameters

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The SSB of Cell 2 is completely within UE’s active BWP BW. The RBs containing SSB from cell 1 and cell 2 should be different in frequency location within the cell bandwidth. The test configuration refer to Table A.6.6.2.11.1-1. The test parameters refer to Tables A.6.6.2.11.1-2 and A.6.6.2.11.1-3 except those described in Table A.X.5.2.3.2-1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.5.2.3.2-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without gap**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1, 2 | AWGN+[220Hz] | | | |
|  |  | 3 | AWGN+[500Hz] | | | |

A.X.5.2.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [800] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

<Editor’s note: If the scaling factor assumption is updated in future meeting, this measurement reporting delay would be updated correspondingly.>

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.X.5.3 L1-RSRP measurement for beam reporting for ATG

#### A.X.5.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.X.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5D.4.1, with the testing configurations for NR ATG cells in Table A.X.5.3.1.1-1.

Table A.X.5.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test for ATG

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

##### A.X.5.3.1.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). The test parameters from Table A.6.6.4.1.2-1 and Table A.6.6.4.1.2-2 are used except those described in Table A.X.5.3.1.2-1.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.X.5.3.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Propagation condition | 1,2 |  | AWGN [220Hz] |
| 3 | AWGN [500Hz] |

##### A.X.5.3.1.3 Test Requirements

The test requirements of this test case are the same as those defined in clause A.6.6.4.1.3.

#### A.X.5.3.2 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.X.5.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5D.4.2, with the testing configurations for NR ATG cells in Table A.X.5.3.2.1-1.

Table A.X.5.3.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test for ATG

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

##### A.X.5.3.2.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). The test parameters from Table A.6.6.4.3.2-1 and Table A.6.6.4.3.2-2 are used except those described in Table A.X.5.3.2.2-1.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.X.5.3.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Propagation condition | 1,2 |  | AWGN [220Hz] |
| 3 | AWGN [500Hz] |

##### A.X.5.3.2.3 Test Requirements

The test requirements of this test case are the same as those defined in clause A.6.6.4.3.3.

### A.X.5.4 L1-SINR measurement for beam reporting for ATG

#### A.X.5.4.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured when DRX is not used

A.X.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8D.4.1, with the testing configurations for NR ATG cells in Table A.X.5.4.1.1-1.

Table A.X.5.4.1.1-1: Applicable NR configurations for FR1 CSI-RS based L1-SINR test for ATG

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

A.X.5.4.1.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). The test parameters from [Table A.6.6.8.2-1] and [Table A.6.6.8.2-2] are used except those described in Table A.X.5.4.1.2-1.

In the CSI-RS measurement configuration, UE is indicated to perform L1-SINR measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in [Table A.6.6.8.2-1].

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.X.5.4.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| DRX configuration | 1~3 |  | Off |
| Propagation condition | 1,2 |  | AWGN [220Hz] |
| 3 | AWGN [500Hz] |

A.X.5.4.1.3 Test Requirements

The test requirements of this test case are the same as those defined in clause [A.6.6.8.3].

#### A.X.5.4.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is not used

##### A.X.5.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8D.4.2, with the testing configurations for NR ATG cells in Table A.X.5.4.2.1-1.

Table A.X.5.4.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR for ATG

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

##### A.X.5.4.2.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). The test parameters from Table A.6.6.8.2.2-1, Table A.6.6.8.2.2-2, and Table A.6.6.8.2.2-3 are used except those described in Table A.X.5.4.2.2-1.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-RS resources, and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

Table A.X.5.4.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Propagation condition | 1,2 |  | AWGN [220Hz] |
| 3 | AWGN [500Hz] |

##### A.X.5.4.2.3 Test Requirements

The test requirements of this test case are the same as those defined in clause A.6.6.8.2.3.

#### A.X.5.4.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is not used

##### A.X.5.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR configured in clause 9.8D.4.3, with the testing configurations for NR ATG cells in Table A.X.5.4.3.1-1.

Table A.X.5.4.3.1-1: Applicable NR configurations for FR1 L1-SINR test with CMR and dedicated IMR for ATG

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

##### A.X.5.4.3.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). The test parameters from Table A.6.6.8.3.2-1 and Table A.6.6.8.3.2-2 are used except those described in Table A.X.5.4.3.2-1.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-IM as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. UE is also configured to measure L1-SINR based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.8.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-IM as IMR.

Table A.X.5.4.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| Propagation condition | 1,2 |  | AWGN [220Hz] |
| 3 | AWGN [500Hz] |

##### A.X.5.4.3.3 Test Requirements

The test requirements of this test case are the same as those defined in clause A.6.6.8.3.3

### A.X.5.5 NR measurements with autonomous gaps for ATG

#### A.X.5.5.1 SA intra-frequency CGI identification of NR neighbor cell in FR1

##### A.X.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of intra-frequency CGI identification of an NR neighbour ATG cell in FR1 with autonomous gaps. This test shall partly verify the measurement requirements in Clause 9.11D, with the testing configurations for NR ATG cells in Table A.X.5.5.1.1-1

Table A.X.5.5.1.1-1: Supported test configurations for ATG

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

##### A.X.5.5.1.2 Test Parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the FR1 PCell and Cell 2 is an FR1 neighbour cell on the same frequency as the PCell. The test parameters from Table A.6.6.7.1.2-2 and Table A.6.6.7.1.2-3 are used except those described in A.X.5.5.1.2-1.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable. A measurement object is configured for the frequency of the PCell and it is indicated to the UE that event-triggered reporting with Event A3 is used. The UE is expected to detect and send a measurement report with Event A3.

A new RRC message triggering CGI identification shall be sent to the UE during period T2, after the UE has reported Event A3. The RRC message shall create a measurement report configuration with purpose *reportCGI* and *useAutonomousGaps* set to TRUE. The start of T3 is the instant when the last TTI containing the RRC message implying CGI identification is sent to the UE.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell during T3 until a measurement report with CGI is sent.

Table A.X.5.5.1.2-1: NR Cell specific test parameters for SA intra-frequency CGI identification of NR neighbor cell in FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| Propagation Condition |  | 1,2 | AWGN [220Hz] | | | |
| 3 | AWGN [500Hz] | | | |

##### A.X.5.5.1.3 Test Requirements

The test requirements of this test case are the same as those defined in clause A.6.6.7.1.3

## A.X.6 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.

- Measurements are performed in RRC\_CONNECTED state.

- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

A.X.6.1 SS-RSRP for ATG UE

A.X.6.1.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.1.1 and 10.1.2.1.2 for intra-frequency measurements.

A.X.6.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.X.6.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.6.7.1.1.2-2, except those described in the Table A.X.6.1.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

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

Table A.X.6.1.1.2-2: SS-RSRP Intra frequency test parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

A.X.6.1.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.X.6.1.2.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test**

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

A.X.6.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.X.6.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.6.7.1.2.2-1, except those described in the Table A.X.6.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.X.6.1.2.2-1: SS-RSRP inter-frequency test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirement in clause 10.1.4.1.1 and relative requirement in clause 10.1.4.1.2.

A.X.6.2 SS-RSRQ for ATG UE

A.X.6.2.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

A.X.6.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.X.6.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.6.7.2.1.2-2, except those described in the given in Table A.X.6.2.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

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

**Table A.X.6.2.1.2-2: SS-RSRQ Intra frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

A.X.6.2.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.1.1 and 10.1.9.1.2.

A.X.6.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.X.6.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.6.7.2.2.2-2 except those described in the Table A.X.6.2.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

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

**Table A.X.6.2.2.2-2: SS-RSRQ Inter frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.1.1 and 10.1.9.1.2.

A.X.6.3 SS-SINR for ATG UE

A.X.6.3.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

A.X.6.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.X.6.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.6.7.3.1.2-2, except those described in the Table A.X.6.3.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

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

**Table A.X.6.3.1.2-2: SS-SINR Intra frequency test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

A.X.6.3.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.14.1.1 and 10.1.14.1.2.

A.X.6.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.X.6.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.6.7.3.2.2-2, except those described in the Table A.X.6.3.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

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

**Table A.X.6.3.2.2-2: SS-SINR Inter frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

A.X.6.4 L1-RSRP measurement for beam reporting for ATG UE

A.X.6.4.1 SSB based L1-RSRP measurement

A.X.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5D.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.X.6.4.1.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.**Table A.X.6.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

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

A.X.6.4.1.2 Test parameters

In this set of test cases there one cell in the test, PCell (Cell 1).. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.1.2-1, except those described in the Table A.X.6.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

**Table A.X.6.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | **Test 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | AWGN+220Hz |
| Config 3 | - | AWGN+500Hz | AWGN+500Hz |

A.X.6.4.1.3 Test Requirements

The L1-RSRP measurement accuracy for SSB resource reported by UE in L1-RSRP report (SSB#0 or SSB#1) of Cell 2 shall fulfil the requirements in clauses 10.1.19.1.

A.X.6.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

A.X.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5D.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.X.6.4.2.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test**

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

A.X.6.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.2.2-2 is used except those described in the Table A.X.6.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

**Table A.X.6.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | **Test 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | AWGN+220Hz |
| Config 3 | - | AWGN+500Hz | AWGN+500Hz |

A.X.6.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS resource reported by UE in L1-RSRP report (CSI-RS#0 or CSI-RS#1) of Cell 1 shall fulfil the requirements in clause 10.1.19.2.

### A.X.6.5 L1-SINR measurement for beam reporting based CMR for ATG UE

A.X.6.5.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

A.X.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.8D.4.1 and clause 10.1.27.1 for L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.X.6.5.1.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.5.1.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

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

A.X.6.5.1.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1).The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.6.7.9.1.2-1 except those described in Table A.X.6.5.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

**Table A.X.6.5.1.2-1: FR1 CSI-RS based L1-SINR test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | **Test 2** |
| Propagation condition | 1, 2 |  | AWGN+220Hz | AWGN+220Hz |
|  | 3 |  | AWGN+500Hz | AWGN+500Hz |

A.X.6.5.1.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.27.1.

#### A.X.6.5.2 L1-SINR measurement with SSB based CMR and dedicated IMR

##### A.X.6.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.8D.4.2 and clause 10.1.27.2 for L1-SINR measurements with SSB based CMR and dedicated CSI-RS based IMR, with the testing configurations for NR cells in Table A.X.6.5.2.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.6.5.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

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

##### A.X.6.5.2.2 Test parameters

In this set of test cases there one cell in the test, PCell (Cell 1). The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.6.7.9.2.2-1 except those described in the Table A.X.6.5.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-RS resource set with two CSI-RS resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

Table A.X.6.5.2.2-1: FR1 SSB based L1-SINR test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| Propagation condition | 1, 2 |  | AWGN+220Hz | AWGN+220Hz |
|  | 3 |  | AWGN+500Hz | AWGN+500Hz |

##### A.X.6.5.2.3 Test Requirements

The L1-SINR measurement accuracy for SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 of Cell 1 shall fulfil the requirements in clauses 10.1.27.2.

#### A.X.6.5.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

##### A.X.6.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8D.4.3 and clause 10.1.27.3 for L1-SINR measurements based on CSI-RS as CMR and CSI-IM as IMR with the testing configurations for NR cells in Table A.X.6.5.3.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

Table A.X.6.5.3.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

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

##### A.X.6.5.3.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.6.7.9.3.2-1 except those described in Table A.X.6.5.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR.

**Table A.X.6.5.3.2-1: FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | **Test 2** |
| Propagation condition | 1, 2 |  | AWGN+220Hz | AWGN+220Hz |
|  | 3 |  | AWGN+500Hz | AWGN+500Hz |

##### A.X.6.5.3.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM# of Cell 1 shall fulfil the requirements in clause 10.1.27.3.

A.X.6.6 CSI-RSRP for ATG UE

A.X.6.6.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.3.1 and 10.1.2.3.2 for CSI-RS intra-frequency measurements.

A.X.6.6.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.X.6.6.1.2-1. Both absolute and relative accuracy of CSI-RSRP intra-frequency measurements are tested by using the parameters in Table A.6.7.10.1.2-2, except those described in the Table A.X.6.6.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.6.1.2-1: CSI-RSRP intra frequency supported test configurations**

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

**Table A.X.6.6.1.2-2: CSI-RSRP intra frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.6.1.3 Test Requirements

The CSI-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.2.3.1 and relative requirement in clause 10.1.2.3.2.

A.X.6.6.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.4.3.1 and 10.1.4.3.2 for CSI-RS inter-frequency measurements with the testing configurations for NR cells in Table A.X.6.6.2.1-1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.6.2.1-1: Applicable NR configurations for FR1 inter-frequency CSI-RSRP accuracy test**

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

A.X.6.6.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency than the PCell. Both absolute and relative accuracy of CSI-RSRP inter-frequency measurements are tested by using the parameters in Table A.6.7.10.2.2-1, except those described in the Table A.X.6.6.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.X.6.6.2.2-1: CSI-RSRP inter-frequency test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.6.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirement in clause 10.1.4.3.1 and relative requirement in clause 10.1.4.3.2.

A.X.6.7 CSI-RSRQ for ATG UE

A.X.6.7.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.2.

A.X.6.7.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.X.6.7.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is tested by using the parameters in Table A.6.7.11.1.2-2, except those described in the Table A.X.6.7.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.7.1.2-1: Intra frequency CSI-RSRQ supported test configurations**

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

**Table A.X.6.7.1.2-2: CSI-RSRQ Intra frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.7.1.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.2.

A.X.6.7.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.2.1 and 10.1.9.2.2.

A.X.6.7.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.X.6.7.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test parameters in Table A.7.11.2.2-2, except those described in the Table A.X.6.7.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.**Table A.X.6.7.2.2-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

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

**Table A.X.6.7.2.2-2: CSI-RSRQ Inter frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.7.2.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.2.1 and 10.1.9.2.2.

A.X.6.8 CSI-SINR for ATG UE

A.X.6.8.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.2.1.

A.X.6.8.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.X.6.8.1.2-1. The absolute accuracy of CSI-SINR intra-frequency measurement is tested by using the parameters in Table A.6.7.12.1.2-2, except those described in the Table A.X.6.8.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.8.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

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

**Table A.X.6.8.1.2-2: CSI-SINR Intra frequency test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.8.1.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.2.1.

A.X.6.8.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.X.6.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.14.2.1 and 10.1.14.2.2.

A.X.6.8.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.X.6.8.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test parameters in Table A.6.7.12.2.2-2, except those described in the Table A.X.6.8.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

**Table A.X.6.8.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

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

**Table A.X.6.8.2.2-2: CSI-SINR Inter frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Test configuration** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|  |  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| **Propagation Condition** | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

A.X.6.8.2.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.2.1 and 10.1.14.2.2.

**<End of change>**