# A.6 NR standalone tests with all NR cells in FR1

## A.6.1 SA: RRC\_IDLE state mobility

### A.6.1.1 Cell re-selection to NR

#### A.6.1.1.1 Cell reselection to FR1 intra-frequency NR case

##### A.6.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

##### A.6.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.1.2-1, A.6.1.1.1.2-2 and A.6.1.1.1.2-3. 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.

Table A.6.1.1.1.2-1: 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.6.1.1.1.2-2: General test parameters for intra 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 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 | Configured in SIB2 of Cell 1 |
|  | SMTC.6 | Configured in SIB2 of Cell 2 |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1, 2, 3 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.6.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
|  |  | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration |  | 1 | N/A | | | N/A | | |
|  |  | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
|  |  | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| configuration |  | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
|  |  | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| RMC configuration |  | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
|  |  | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| CORESET RMC |  | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| configuration |  | 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 | -130 | | | -130 | | |
|  |  | 3 | -127 | | | -127 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2, 3 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 16 | -3.11 | 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 | -82 | -85 | -82 | -infinity | -82 | -85 |
|  |  | 2 | -82 | -85 | -82 | -infinity | -82 | -85 |
|  |  | 3 | -79 | -82 | -79 | -infinity | -79 | -82 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -52.21 | -52.21 | Same as parameters specified in Cell 1 columns | | |
|  |
|  | dBm/9.36 MHz | 2 | -53.94 | -52.21 | -52.21 |
|  |  | | |
|  | dBm/38.16 MHz | 3 | -47.85 | -46.12 | -46.12 |
|  |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sintrasearch | dB | 1, 2, 3 | 60 | | | 60 | | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.6.1.1.1.3 Test Requirements

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 4.2.2.3-1 in clause 4.2.2.3

Tevaluate, NR\_ intra See Table 4.2.2.3-1 in clause 4.2.2.3

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.

This gives a total of 33.28 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.68 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

#### A.6.1.1.2 Cell reselection to FR1 inter-frequency NR case

##### A.6.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

##### A.6.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.6.1.1.2.2-1, A.6.1.1.2.2-2 and A.6.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

Table A.6.1.1.2.2-1: Supported test configurations

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

Table A.6.1.1.2.2-2: 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 | Cell 2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
| Neighbour cell |  | 1, 2, 3 | Cell 1 |
| T1 end condition | Active cell |  | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| Neighbour cells |  | 1, 2, 3 | Cell2 |
| T3 end condition | Active cell |  | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| Neighbour cell |  | 1, 2, 3 | Cell 1 |
| RF Channel Number | |  | 1, 2, 3 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTCconfiguration | |  | 1 | SMTC.2 | Configured in SIB4 of Cell 1 |
|  | SMTC.6 | Configured in SIB4 of Cell 2 |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.6.1.1.2.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
|  |  | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration |  | 1 | N/A | | | N/A | | |
|  |  | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
|  |  | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| configuration |  | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
|  |  | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| RMC configuration |  | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
|  |  | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| CORESET RMC |  | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| configuration |  | 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 | 14 | 14 | 14 | -4 | -infinity | 12 |
|  |  | 2 |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  |  |  |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
|  |  | 2 | -98 | | | | | |
|  |  | 3 | -95 | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | |
|  |  | 2 |  | | | | | |
|  |  | 3 |  | | | | | |
|  | dB | 1 | 14 | 14 | 14 | -4 | -infinity | 12 |
|  |  | 2 |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  |  |  |
| SS-RSRP Note3 | dBm/SCS | 1 | -84 | -84 | -84 | -102 | -infinity | -86 |
|  |  | 2 | -84 | -84 | -84 | -102 | -infinity | -86 |
|  |  | 3 | -81 | -81 | -81 | -99 | -infinity | -83 |
| Io | dBm/9.36 MHz | 1 | -55.88 | -55.88 | -55.88 | -68.60 | -70.05 | -57.78 |
|  | dBm/9.36 MHz | 2 | -55.88 | -55.88 | -55.88 | -68.60 | -70.05 | -57.78 |
|  | dBm/38.16 MHz | 3 | -49.79 | -49.79 | -49.79 | -62.50 | -63.96 | -51.69 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | |
| Threshx, highP | dB | 1, 2, 3 | 48 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3 | 44 | | | 44 | | |
| Threshx, lowP | dB | 1, 2, 3 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.6.1.1.2.3 Test Requirements

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

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

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

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

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

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

Where:

Thigher\_priority\_search See clause 4.2.2.7

Tevaluate, NR\_ inter See Table 4.2.2.4-1 in clause 4.2.2.4

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

A.6.1.2 Inter-RAT E-UTRAN cell re-selection

#### A.6.1.2.1 Cell reselection to higher priority E-UTRAN

##### A.6.1.2.1.1 Test Purpose and Environment

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

##### A.6.1.2.1.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.1.2-1, A.6.1.2.1.2-2, A.6.1.2.1.2-3 and A.6.1.2.1.2-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Table A.6.1.2.1.2-1: Supported test configurations

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

Table A.6.1.2.1.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2. |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T2. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T3 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T3 for iteration of the tests. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [23] |
| 4, 5, 6 | 4 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | >7 | During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3, 4, 5, 6 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.6.1.2.1.2-3: Cell specific test parameters for NR cell 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | |
| **T1** | **T2** | **T3** |
| TDD configuration |  | 1, 4 | N/A | | |
|  | 2, 5 | TDDConf.1.1 | | |
|  | 3, 6 | TDDConf.2.1 | | |
| PDSCH parameters |  | 1, 4 | SR.1.1 FDD | | |
|  | 2, 5 | SR.1.1 TDD | | |
|  | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET parameters |  | 1, 4 | CR.1.1 FDD | | |
|  | 2, 5 | CR.1.1 TDD | | |
|  | 3, 6 | CR.2.1 TDD | | |
| Dedicated CORESET parameters |  | 1, 4 | CCR.1.1 FDD | | |
|  | 2, 5 | CCR.1.1 TDD | | |
|  | 3, 6 | CCR.2.1 TDD | | |
| SSB parameters |  | 1, 4 | SSB.1 FR1 | | |
|  | 2, 5 | SSB.1 FR1 | | |
|  | 3, 6 | SSB.2 FR1 | | |
| NR SMTC parameters |  | 1, 4 | SMTC.2 | | |
|  | 2, 5 | SMTC.1 | | |
|  | 3, 6 | SMTC.1 | | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
| 3, 6 | -137 | | |
|  | dBm/SCS | 1, 4 | -98 | | |
| 2, 5 | -98 | | |
| 3, 6 | -95 | | |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| SS-RSRP | dBm/SCS | 1, 4 | -84 | -84 | -84 |
| 2, 5 | -84 | -84 | -84 |
| 3, 6 | -81 | -81 | -81 |
|  | dB | 1, 4 | 14 | 14 | 14 |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | 14 | 14 | 14 |
| 2, 5 |
| 3, 6 |
| Io | dBm/9.36 MHz | 1, 4 | -55.88 | -55.88 | -55.88 |
| dBm/9.36 MHz | 2, 5 | -55.88 | -55.88 | -55.88 |
| dBm/38.16 MHz | 3, 6 | -49.79 | -49.79 | -49.79 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Threshx, highP (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | | |
| Threshx, lowP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, high** which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | | |

Table A.6.1.2.1.2-4: Cell specific test parameters for E-UTRA cell 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | | | |
| **T1** | **T2** | | **T3** |
| E-UTRA RF Channel number |  | 1 | | | |
| BWchannel | MHz | 10 | | | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | | | |
| PBCH\_RA | dB | 0 | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | | |
|  | dBm/15 kHz | -98 | | | |
| RSRP | dBm/15 KHz | -infinity | | -86 | -102 |
|  | dB | -infinity | | 12 | -4 |
|  | dB | -infinity | | 12 | -4 |
| TreselectionEUTRAN | S | 0 | | | |
| SnonintrasearchP | dB | Not sent | | | |
| Threshx, highP | dB | 48 | | | |
| Threshserving, lowP | dB | 44 | | | |
| Threshx, lowP (Note 2) | dB | 50 | | | |
| Propagation Condition |  | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, Low** which is included in E-UTRA system information, and is a threshold for the NR target cell | | | | | |

##### A.6.1.2.1.3 Test Requirements

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

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

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: Thigher\_priority\_search + Tevaluate, E-UTRAN + TSI-E-UTRA,

Where:

Thigher\_priority\_search See clause 4.2.2.7

Tevaluate, E-UTRAN See Table 4.2.2.5-1 in clause 4.2.2.5

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

#### A.6.1.2.2 Cell reselection to lower priority E-UTRAN

##### A.6.1.2.2.1 Test Purpose and Environment

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

##### A.6.1.2.2.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.2.2-1, A.6.1.2.2.2-2, A.6.1.2.2.2-3 and A.6.1.2.2.2-4. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

Table A.6.1.2.2.2-1: Supported test configurations

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

Table A.6.1.2.2.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [23] |
| 4, 5, 6 | 4 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.6.1.2.2.2-3: Cell specific test parameters for NR cell 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | |
| **T1** | **T2** |
| TDD configuration |  | 1, 4 | N/A | |
|  | 2, 5 | TDDConf.1.1 | |
|  | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | |
|  | 2, 5 | SR.1.1 TDD | |
|  | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | |
|  | 2, 5 | CR.1.1 TDD | |
|  | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | |
|  | 2, 5 | CCR.1.1 TDD | |
|  | 3, 6 | CCR.2.1 TDD | |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | |
|  | 2, 5 | SSB.1 FR1 | |
|  | 3, 6 | SSB.2 FR1 | |
| SMTC configuration |  | 1, 4 | SMTC.2 | |
|  | 2, 5 | SMTC.1 | |
|  | 3, 6 | SMTC.1 | |
| OCNG Pattern |  | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| 3, 6 | -137 | |
|  | dBm/SCS | 1, 4 | -98 | |
| 2, 5 | -98 | |
| 3, 6 | -95 | |
|  | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| SS-RSRP | dBm/SCS | 1, 4 | -102 | -86 |
| 2, 5 | -102 | -86 |
| 3, 6 | -99 | -83 |
|  | dB | 1, 4 | -4 | 12 |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | -4 | 12 |
| 2, 5 |
| 3, 6 |
| Io | dBm/9.36 MHz | 1, 4 | -68.60 | -57.78 |
| dBm/9.36 MHz | 2, 5 | -68.60 | -57.78 |
| dBm/38.16 MHz | 3, 6 | -62.50 | -51.69 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | Not sent | |
| Threshx, highP | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| Threshx, lowP (Note 2) | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, Low** which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | |

**Table A.6.1.2.2.2-4: Cell specific test parameters for E-UTRA cell 2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | |
| **T1** | **T2** |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | |
|  | dBm/15 kHz | -98 | |
| RSRP | dBm/15 KHz | -84 | -84 |
|  | dB | 14 | 14 |
|  | dB | 14 | 14 |
| TreselectionEUTRAN | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| Threshx, highP (Note 2) | dB | 48 | |
| Threshserving, lowP | dB | 44 | |
| Threshx, lowP | dB | 50 | |
| Propagation Condition |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, high** which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

##### A.6.1.2.2.3 Test Requirements

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

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

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: Tevaluate, E-UTRAN + TSI-E-UTRA,

Where:

Tevaluate, E-UTRAN See Table 4.2.2.5-1 in clause 4.2.2.5

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

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

## A.6.2 SA: RRC\_INACTIVE state mobility

## A.6.3 RRC\_CONNECTED state mobility

A.6.3.1 Handover

#### A.6.3.1.1 Intra-frequency handover from FR1 to FR1; known target cell

##### A.6.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

##### A.6.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.1.2-2, and A.6.3.1.1.2-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE 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.

Table A.6.3.1.1.2-1: 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 |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.6.3.1.1.2-2: General test parameters Intra-frequency handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

Table A.6.3.1.1.2-3: 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** |
| NR RF Channel Number | | |  | 1 | | | | | | 1 | | | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | | | | | |
| Config 2,3 | TDD | | | | | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | | | | | |
| Config 2 |  | TRS.1.1 TDD | | | | | | | | | | |
| Config 3 |  | TRS.1.2 TDD | | | | | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | | | | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | |
| Config 3 | 30 kHz | | | | | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | |
| Config 3 | 30 kHz | | | | | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | | | | | |
| BWP configuraiton | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | | | | | |
| Config 3 | | -95 | | | | | | | | | | |
|  | | | dB | 8 | -3.3 | | -3.3 | | -Infinity | | 2.36 | | 2.36 | |
|  | | | dB | 8 | 8 | | 8 | | -Infinity | | 11 | | 11 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -90 | | -Infinity | | -87 | | -87 | |
| Config 3 | | dBm/SCS | -87 | -87 | | -87 | | -Infinity | | -84 | | -84 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -57.06 | | -57.06 | | -61.41 | | -57.06 | | -57.06 | |
| Config 3 | | dBm/  38.16MHz | -55.31 | -50.96 | | -50.96 | | -55.31 | | -50.96 | | -50.96 | |
| Propagation condition | | | - | AWGN | | | | | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | | | | |

##### A.6.3.1.1.3 Test Requirements

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

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

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

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

Tinterrupt = 62 ms in the test. Tinterrupt is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

#### A.6.3.1.2 Intra-frequency handover from FR1 to FR1; unknown target cell

##### A.6.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

##### A.6.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.2.2-2, and A.6.3.1.2.2-3.

The test scenario comprises of two cells on one 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.

Table A.6.3.1.2.2-1: 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 |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.6.3.1.2.2-2: General test parameters Intra-frequency handover from FR1 to FR1

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

Table A.6.3.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | | | **Cell 2** | | |
| **T1** | | **T2** | | **T1** | | **T2** |
| NR RF Channel Number | | |  | 1 | | | | 1 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
| Config 2,3 | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | |
| Config 3 | TDDConf. 2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
| Config 2 |  | TRS.1.1 TDD | | | | | | |
| Config 3 |  | TRS.1.2 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | |
| Config 3 | | -95 | | | | | | |
|  | | | dB | 8 | -0.64 | | -Infinity | | -0.64 | |
|  | | | dB | 8 | 8 | | -Infinity | | 8 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -Infinity | | -90 | |
| Config 3 | | dBm/SCS | -87 | -87 | | -Infinity | | -87 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -58.71 | | -61.41 | | -58.71 | |
| Config 3 | | dBm/  38.16MHz | -55.31 | -52.60 | | -55.31 | | -52.60 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | |

##### A.6.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T2.

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

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

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

Tinterrupt = 82 ms in the test. Tinterrupt is defined in clause 6.1.1.2.2.

This gives a total of 92 ms.

#### A.6.3.1.3 Inter-frequency handover from FR1 to FR1; unknown target cell

##### A.6.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements specified in clause 6.1.1.2.

##### A.6.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.3.2-2, and A.6.3.1.3.2-3.

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.

Table A.6.3.1.3.2-1: 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 |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.6.3.1.3.2-2: General test parameters Inter-frequency handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |

Table A.6.3.1.3.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | | | **Cell 2** | | |
| **T1** | | **T2** | | **T1** | | **T2** |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
| Config 2,3 | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
| Config 2 |  | TRS.1.1 TDD | | | | | | |
| Config 3 |  | TRS.1.2 TDD | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | -98 | | | |
| Config 3 | | -95 | | | -95 | | | |
|  | | | dB | 4 | 4 | | -Infinity | | 5 | |
|  | | | dB | 4 | 4 | | -Infinity | | 5 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -94 | -94 | | -Infinity | | -93 | |
| Config 3 | | dBm/SCS | -91 | -91 | | -Infinity | | -90 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 | -64.59 | | -70.05 | | -63.85 | |
| Config 3 | | dBm/  38.16MHz | -58.49 | -58.49 | | -63.94 | | -57.75 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | |

##### A.6.3.1.3.3 Test Requirements

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 6.1.1.2.2.

This gives a total of 132 ms.

#### A.6.3.1.4 SA NR - E-UTRAN handover

##### A.6.3.1.4.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.4-1. General test parameters are provided in Table A.6.3.1.4-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.4-3 and A.6.3.1.4-4 respectively.

Table A.6.3.1.4-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

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

Table A.6.3.1.4-2: General test parameters for SA inter-RAT E-UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | NR cell |
| Neighbouring cell |  | Cell 2 | E-UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | |  | RSRP |  |
| b2-Threshold1 | | dBm | As specified in Table A.6.3.1.4-3 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2EUTRAN | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | | dB | 0 |  |
| TimeToTrigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | |  | 0 | As specified in Table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

Table A.6.3.1.4-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 1** | | |
|  |  |  | **T1** | **T2** | **T3** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode |  | 1, 4 | FDD | | |
|  |  | 2, 3, 5, 6 | TDD | | |
| TDD Configuration |  | 2, 5 | TDDConf.1.1 | | |
|  |  | 3, 6 | TDDConf.2.1 | | |
| BWchannel | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | | |
|  |  | 2, 5 | 10: NRB,c = 52 (TDD) | | |
|  |  | 3, 6 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement |  | 1, 4 | SR.1.1 FDD | | |
| channel |  | 2, 5 | SR.1.1 TDD | | |
|  |  | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel |  | 1, 4 | CR.1.1 FDD | | |
|  |  | 2, 5 | CR.1.1 TDD | | |
|  |  | 3, 6 | CR.2.1 TDD | | |
| TRS configuration |  | 1, 4 | TRS.1.1 FDD | | |
|  |  | 2, 5 | TRS.1.1 TDD | | |
|  |  | 3, 6 | TRS.1.2 TDD | | |
| OCNG patternNote1 |  | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | |
| SMTC configuration |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration |  | 1, 2, 4, 5 | SSB.1 FR1 | | |
|  |  | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold1 | dBm | 1, 2, 4, 5 | -96 | | |
|  |  | 3, 6 | -93 | | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS |  |  |  | | |
| *Noc*Note2 | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -100 | -104 | -100 |
| *Noc*Note2 | dBm/SCS | 1, 2, 4, 5 | -100 | -104 | -100 |
|  | 3, 6 | -97 | -101 | -97 |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | -4 |
| Ês/IotNote3 | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | -4 |
| SS-RSRPNote3 | dBm/SCS | 1, 2, 4, 5 | -88 | -104 | -104 |
|  |  | 3, 6 | -85 | -101 | -101 |
| IoNote3 | dBm/9.36 MHz | 1, 2, 4, 5 | -59.78 | -73.04 | -70.59 |
|  | dBm/38.16 MHz | 3, 6 | -53.68 | -66.9448 | -64.49 |
| Propagation condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table A.6.3.1.4-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | | |
| **T1** | **T2** | **T3** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode |  | 1, 2, 3 | FDD | | |
| 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | | |
| 4, 5, 6 | 53 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 8 | 78 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 78 | 78 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 | -90 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 | -90 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -67.21  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | | |

##### A.6.3.1.4.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

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

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

Tinterrupt = 35 ms in the test; Tinterrupt is defined in clause 6.1.2.1.

This gives a total of 85 ms.

#### A.6.3.1.5 SA NR - E-UTRAN handover with unknown target cell

##### A.6.3.1.5.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2 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. No Gap pattern shall be configured.

A RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.5-1. General test parameters are provided in Table A.6.3.1.5-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.5-3 and A.6.3.1.5-4 respectively.

Table A.6.3.1.5-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

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

Table A.6.3.1.5-2: General test parameters for SA inter-RAT E-UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | NR cell |
| Neighbouring cell |  | Cell 2 | E-UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | ≤5 |  |
| T2 | | s | 1 |  |

Table A.6.3.1.5-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Configuration** | **Cell 1** | |
| **T1** | **T2** |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | |  | 1, 4 | FDD | |
| 2, 3, 5, 6 | TDD | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | |
| 3, 6 | TDDConf.2.1 | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | |
| 2, 5 | 10: NRB,c = 52 (TDD) | |
| 3, 6 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | |
| 2, 5 | SR.1.1 TDD | |
| 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | |
| 2, 5 | CR.1.1 TDD | |
| 3, 6 | CR.2.1 TDD | |
| TRS configuration | |  | 1, 4 | TRS.1.1 FDD | |
|  | 2, 5 | TRS.1.1 TDD | |
|  | 3, 6 | TRS.1.2 TDD | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Dedicated DL BWP | DLBWP.1.1 | |
| Initial UL BWP | ULBWP.0.1 | |
| Dedicated UL BWP | ULBWP.1.1 | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | |
| 3, 6 | SSB.2 FR1 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSS | |
| EPRE ratio of OCNG to OCNG DMRS | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -98 | |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -98 | |
| 3, 6 | -95 | |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | 0 | 0 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | 0 | 0 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -98 | -98 |
|  | | 3, 6 | -95 | -95 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -67.04 | -67.04 |
| dBm/38.16 MHz | 3, 6 | -60.94 | -60.94 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table A.6.3.1.5-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | |
| **T1** | **T2** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | |
| 4, 5, 6 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -91 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -91 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -62.43 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

##### A.6.3.1.5.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

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

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

Tinterrupt = 115 ms in the test; Tinterrupt is defined in clause 6.1.2.1.

This gives a total of 165 ms.

A.6.3.2 RRC Connection Mobility Control

#### A.6.3.2.1 SA: RRC Re-establishment

##### A.6.3.2.1.1 Intra-frequency RRC Re-establishment in FR1

A.6.3.2.1.1.1 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. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.1.1-1, table A.6.3.2.1.1.1-2 and table A.6.3.2.1.1.1-3 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.

Table A.6.3.2.1.1.1-1: 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.6.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | OFF |  |
| PRACH configuration | |  | 1, 2, 3 | FR1 PRACH configuration 1 | Table A.3.8.2.1-1 |
| T1 | | s | 1, 2, 3 | 5 |  |
| T2 | | ms | 1, 2, 3 | 200 | Time for the UE to detect RLF |
| T3 | | s | 1, 2, 3 | 2 |  |

Table A.6.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | | | **Cell 2** | | | | |
| **T1** | | **T2** | | **T3** | **T1** | **T2** | | | **T3** |
| TDD configuration |  | 1 | N/A | | | | | N/A | | | | |
| 2 | TDDConf.1.1 | | | | | TDDConf.1.1 | | | | |
| 3 | TDDConf.2.1 | | | | | TDDConf.2.1 | | | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | | | SR.1.1 FDD | | | | |
|  |  | 2 | SR.1.1 TDD | | | | | SR.1.1 TDD | | | | |
|  |  | 3 | SR.2.1 TDD | | | | | SR.2.1 TDD | | | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | | | CR.1.1 FDD | | | | |
| 2 | CR.1.1 TDD | | | | | CR.1.1 TDD | | | | |
| 3 | CR.2.1 TDD | | | | | CR.2.1 TDD | | | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | | | CCR.1.1 FDD | | | | |
| 2 | CCR.1.1 TDD | | | | | CCR.1.1 TDD | | | | |
| 3 | CCR.2.1 TDD | | | | | CCR.2.1 TDD | | | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | | | OP.1 defined in A.3.2.1 | | | | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | | | | TRS.1.1 FDD | | | | |
|  |  | 2 | TRS.1.1 TDD | | | | | TRS.1.1 TDD | | | | |
|  |  | 3 | TRS.1.2 TDD | | | | | TRS.1.2 TDD | | | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | | | DLBWP.0.1 | | | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | | | ULBWP.0.1 | | | | |
| Active DL BWP 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 | 1.54 | | -infinity | | -infinity | -3.79 | 4 | | | 4 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | | | | | | | |
| 2 | -98 | | | | | | | | | |
| 3 | -95 | | | | | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | | | | | |
| 2 |
| 3 |
|  | dB | 1 | 7 | | -infinity | | -infinity | 4 | 4 | | | 4 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -91 | | -infinity | | -infinity | -94 | -94 | | | -94 |
| 2 | -91 | | -infinity | | -infinity | -94 | -94 | | | -94 |
| 3 | -88 | | -infinity | | -infinity | -91 | -91 | | | -91 |
| Io | dBm/9.36 MHz | 1 | -60.74 | | -64.59 | | -64.59 | -60.74 | -64.59 | | | -64.59 |
| dBm/9.36 MHz | 2 | -60.74 | | -64.59 | | -64.59 | -60.74 | -64.59 | | | -64.59 |
| dBm/38.16 MHz | 3 | -54.65 | | -58.50 | | -58.50 | -54.65 | -58.50 | | | -58.50 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | | |

A.6.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

Nfreq = 1

Tidentify\_intra\_NR = 200 ms

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

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms, allow 1.6 s in the test case.

##### A.6.3.2.1.2 Inter-frequency RRC Re-establishment in FR1

A.6.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.2.1-1, table A.6.3.2.1.2.1-2 and table A.6.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

Table A.6.3.2.1.2.1-1: Supported test configurations

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

Table A.6.3.2.1.2.1-2: 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 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | OFF |  |
| PRACH configuration | |  | 1, 2, 3 | FR1 PRACH configuration 1 | Table A.3.8.2.1-1 |
| T1 | | s | 1, 2, 3 | 5 |  |
| T2 | | ms | 1, 2, 3 | 200 | Time for the UE to detect RLF |
| T3 | | s | 1, 2, 3 | 5 |  |

Table A.6.3.2.1.2.1-3: 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.1.2 TDD | | | | TRS.1.2 TDD | | | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | | DLBWP.0.1 | | | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | | ULBWP.0.1 | | | | |
| Active DL BWP 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 | -94 | | -infinity | -infinity | -infinity | -infinity | | | -91 |
| 2 | -94 | | -infinity | -infinity | -infinity | -infinity | | | -91 |
| 3 | -91 | | -infinity | -infinity | -infinity | -infinity | | | -88 |
| Io | dBm/9.36 MHz | 1 | -64.59 | | -70.05 | -70.05 | -70.05 | -70.05 | | | -62.26 |
| dBm/9.36 MHz | 2 | -64.59 | | -70.05 | -70.05 | -70.05 | -70.05 | | | -62.26 |
| dBm/38.16 MHz | 3 | -58.50 | | -63.94 | -63.94 | -63.94 | -63.94 | | | -56.15 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

A.6.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

Nfreq = 2

Tidentify\_intra\_NR = 800 ms

Tidentify\_inter\_NR = 800 ms

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

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

##### A.6.3.2.1.3 Intra-frequency RRC Re-establishment in FR1 without serving cell timing

A.6.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.3.1-1, table A.6.3.2.1.3.1-2 and table A.6.3.2.1.3.1-3 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.

Table A.6.3.2.1.3.1-1: 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.6.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| Neighbour cells |  | 1, 2, 3 | Cell2 |  |
| Final condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | OFF |  |
| PRACH configuration | |  | 1, 2, 3 | FR1 PRACH configuration 1 | Table A.3.8.2.1-1 |
| T1 | | s | 1, 2, 3 | 5 |  |
| T2 | | s | 1, 2, 3 | 6 | Time for the UE to detect RLF |
| T3 | | s | 1, 2, 3 | 3 |  |

Table A.6.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration |  | 1 | N/A | | | N/A | | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
|  |  | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
|  |  | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| TRS Configuration |  | 1 | TRS.1.1.FDD | | | TRS.1.1.FDD | | |
| 2 | TRS.1.1.TDD | | | TRS.1.1.TDD | | |
| 3 | TRS.1.2.TDD | | | TRS.1.2.TDD | | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3 | SSB | | | SSB | | |
|  | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| 2 |
| 3 |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
| 2 | -98 | | | | | |
| 3 | -95 | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| 2 |
| 3 |
| SS-RSRP Note3 | dBm/SCS | 1 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| 2 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| 3 | -91 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.59 | -infinity | -infinity | -infinity | -infinity | -64.59 |
| dBm/9.36 MHz | 2 | -64.59 | -infinity | -infinity | -infinity | -infinity | -64.59 |
| dBm/38.16 MHz | 3 | -58.50 | -infinity | -infinity | -infinity | -infinity | -58.50 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

A.6.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 2.2 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

Nfreq = 1

Tidentify\_intra\_NR = 800 ms

TSI = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2145 ms, allow 2.2 s in the test case.

#### A.6.3.2.2 Random Access

##### A.6.3.2.2.1 Contention based random access test in FR1 for NR standalone

A.6.3.2.2.1.1 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 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.1.1-1. 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.

Table A.6.3.2.2.1.1-1: 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.6.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for NR Standalone

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test-1** | **Comments** |
| SSB Configuration | | Config 1 |  | SSB pattern 1 in FR1 | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Config 2 | SSB pattern 2 in FR1 |
| Number of SSBs per SS-burst | | |  | 2 | Different from the definition in A.3.10 |
| SS/PBCH block index | | |  | 0,1 | Different from the definition in A.3.10 |
| Duplex Mode for Cell 1 | | Config 1 |  | FDD |  |
| Config 2 | TDD |
| TDD Configuration | | Config 2 |  | TDDConf.2.1 |  |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.2 TDD |  |
| OCNG Pattern Note 1 | | |  | OP.1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | Config 1 |  | SR.1.1 FDD | As defined in A.3.1.1. |
| Config 2 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD |  |
|  | | Config 2 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.1 FDD |  |
|  | | Config 2 |  | CCR.2.1 TDD |  |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | 3 |
| SS-RSRP Note 3 | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 |
| Config 2 | -101 |
|  | | dB | -17 |
| SS-RSRP Note 3 | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 2 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | |  | FR1 PRACH configuration 1 | As defined in A.3. 8. |
| Propagation Condition | | | - | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

A.6.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.6.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

A.6.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

A.6.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

A.6.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

##### A.6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone

A.6.3.2.2.2.1 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 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.2.1-1. 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). Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

Table A.6.3.2.2.2.1-1: 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.6.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test-1** | **Test-2** | **Comments** |
| SSB Configuration | | Config 1 |  | SSB pattern 1 in FR1 | SSB pattern 1 in FR1 | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Config 2 | SSB pattern 2 in FR1 | SSB pattern 2 in FR1 |
| Number of SSBs per SS-burst | | |  | 2 | 2 | Different from the definition in A.3.10 |
| SS/PBCH block index | | |  | 0,1 | 0,1 | Different from the definition in A.3.10 |
| CSI-RS Configuration | | Config 1 |  | N/A | CSI-RS.1.1 FDD | As defined in A.3.1.4 |
| Config 2 | CSI-RS.2.1 TDD |
| Duplex Mode for Cell 1 | | Config 1 |  | FDD | FDD |  |
| Config 2 | TDD | TDD |
| TDD Configuration | | Config 2 |  | TDDConf.2.1 | TDDConf.2.1 |  |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| OCNG Pattern Note 1 | | |  | OP.1 | OP.1 | As defined in A.3.2.1. |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 TDD | CR.1.1 TDD |  |
|  | | Config 2 |  | CR.2.1 TDD | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.1.1 TDD | CCR.1.1 TDD |  |
|  | | Config 2 |  | CCR.2.1 TDD | CCR.2.1 TDD |  |
| PDSCH parameters Note 4 | | Config 1 |  | SR.1.1 FDD | SR.1.1 FDD | As defined in A.3.1.1. |
| Config 2 | SR.2.1 TDD | SR.2.1 TDD |
| NR RF Channel Number | | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 | -98 |
| Config 2 | -101 | -101 |
|  | | dB | 3 | 3 |
| SS-RSRP Note 3 | | dBm/ SCS | -95 | -95 |
| SSB with index 1 |  | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1 | dBm/15kHz | -98 | -98 |
| Config 2 | -101 | -101 |
|  | | dB | -17 | -17 |
| SS-RSRP Note 3 | | dBm/ SCS | -115 | -115 |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 2 | -62.2/38.16MHz | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | |  | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A.3.8.2. |
| Propagation Condition | | | - | AWGN | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | | |

A.6.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.6.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.6.3.2.3 SA: RRC Connection Release with Redirection

##### A.6.3.2.3.1 Redirection from NR in FR1 to NR in FR1

A.6.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

A.6.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.1.2-2, and A.6.3.2.3.1.2-3.

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.6.3.2.3.1.2-1: 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.6.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 2.3 |  |

Table A.6.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | | | **Cell 2** | | |
| **T1** | | **T2** | | **T1** | | **T2** |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
| Config 2,3 | TDD | | | | | | |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | | | | | | |
| Config 2 |  | SSB.1 FR1 | | | | | | |
| Config 3 |  | SSB.2 FR1 | | | | | | |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD | | | | | | |
| Config 2 |  | TRS.1.1 TDD | | | | | | |
| Config 3 |  | TRS.1.2 TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
| Config 2 | SR.1.1 TDD | | | | | | |
| Config 3 | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
| Config 2 | CR.1.1 TDD | | | | | | |
| Config 3 | CR2.1 TDD | | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | |
| SMTC configuration | | Config 1,2 |  | SMTC.1 FR1 | | | | | | |
| Config 3 | SMTC.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
| Config 3 | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP configuraiton | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | |
| Config 3 | | -95 | | | | | | |
|  | | | dB | 4 | 4 | | -infinity | | 4 | |
|  | | | dB | 4 | 4 | | -infinity | | 4 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 | -64.59 | | -70.05 | | -64.59 | |
| Config 3 | | dBm/  38.16MHz | -58.49 | -58.49 | | -63.94 | | -58.49 | |
| Propagation condition | | | - | AWGN | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | |

A.6.3.2.3.1.3 Test Requirements

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 msin 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.

This gives a total of 2240 ms.

##### A.6.3.2.3.2 Redirection from NR in FR1 to E-UTRAN

A.6.3.2.3.2.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to E-UTRAN requirements specified in clause 6.2.3.2.2.

A.6.3.2.3.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.2.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.2.2-2, A.6.3.2.3.2.2-3 and A.6.3.2.3.2.2-4.

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.

Table A.6.3.2.3.2.2-1: Redirection from NR to E-UTRAN test configurations

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

Table A.6.3.2.3.2.2-2: General test parameters for Redirection from NR to E-UTRAN test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 2.3 |  |

Table A.6.3.2.3.2.2-3: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 1)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | |
| **T1** | | **T2** |
| RF Channel Number | | |  | 1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | |
| Config 2,3,5,6 | TDD | | |
| SSB Configuration | | Config 1 |  | SSB.1 FR1 | | |
| Config 2 |  | SSB.1 FR1 | | |
| Config 3 |  | SSB.2 FR1 | | |
| CSI-RS for tracking | | Config 1 |  | TRS.1.1 FDD | | |
| Config 2 |  | TRS.1.1 TDD | | |
| Config 3 |  | TRS.1.2 TDD | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| BWP BW | | Config 1,4 | MHz | 10: NRB,c = 52 | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| DRx Cycle | | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR2.1 TDD | | |
| CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR2.1 TDD | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | |
| SMTC configuration | | Config 1,2,4,5 |  | SMTC.1 FR1 | | |
| Config 3,6 | SMTC.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | |
| Config 3,6 | 30 kHz | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | |
| Config 3,6 | 30 kHz | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | |
| BWP configuraiton | | Initial DL BWP |  | DLBWP.0.1 | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | |
| Initial UL BWP |  | ULBWP.0.1 | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -98 | | |
| Config 3,6 | | -95 | | |
|  | | | dB | 4 | 4 | |
|  | | | dB | 4 | 4 | |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -64.59 | -64.59 | |
| Config 3,6 | | dBm/  38.16MHz | -58.49 | -58.49 | |
| Propagation condition | | | - | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table A.6.3.2.3.2.2-4: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | |
| **T1** | **T2** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | |
| 4, 5, 6 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -64.76 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

A.6.3.2.3.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

Tconnection\_release\_redirect\_E-UTRA = TRRC\_procedure\_delay + Tidentify-E-UTRA + TSI-E-UTRA + TRACH,

where:

TRRC\_procedure\_delay = 110 ms in the test.

Tidentify-E-UTRA = 800 ms in the test.

TSI-E-UTRA = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target E-UTRA cell.

TRACH = 15 ms in the test.

This gives a total of 2205 ms.

## A.6.4 Timing

A.6.4.1 UE transmit timing

#### A.6.4.1.1 NR UE Transmit Timing Test for FR1

##### A.6.4.1.1.1 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 7.1.2.

Supported test configurations are shown in Table A.6.4.1.1.1-1.

Table A.6.4.1.1.1-1: Supported test configurations for FR1 PCell

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

For this test a single NR cell is used. Table A.6.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.6.4.1.1.1-3.

Table A.6.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Test1** | | **Test2** | |
| SSB ARFCN |  | 1,2,3 | 1 | | 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 | | | DRX.8Note5 |
| 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 | | 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 | | -98 | |
| Note2 | dBm/SCS | 1,2 | -98 | | -98 | |
| 3 | -95 | | -95 | |
|  |  | 1,2,3 | 3 | | 3 | |
|  |  | 1,2,3 | 3 | | 3 | |
| SS-RSRPNote3 | dBm/SCS | 1,2 | -95 | | -95 | |
| 3 | -92 | | -92 | |
| IoNote3 | dBm/9.36MHz | 1,2 | -65.2 | | -65.2 | |
| dBm/38.1MHz | 3 | -59.2 | | -59.2 | |
| Propagation condition |  | 1,2,3 | AWGN | | | |
| SRS Config |  | 1,2 | SRSConf.1Note6 | SRSConf.3Note6 | | |
|  | 3 | SRSConf.1Note6 | SRSConf.2Note6 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: DRx related parameters are given in Table A.3.3.8-1  Note 6: SRS configs are given in Table A.6.4.1.1.1-3 | | | | | | |

Table A.6.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | SRSConf.3 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 |  |
| srs-ResourceIdList | 0 | 0 | 0 |  |
| resourceType | Periodic | Periodic | Periodic |  |
| Usage | Codebook | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 | 0 |  |
| nrofSRS-Ports | Port1 | Port1 | Port1 |  |
| transmissionComb | n2 | n2 | n2 |  |
| combOffset-n2 | 0 | 0 | 0 |  |
| cyclicShift-n2 | 0 | 0 | 0 |  |
| resourceMapping  startPosition | 0 | 0 | 0 |  |
| resourceMapping  nrofSymbols | n1 | n1 | n1 |  |
| resourceMapping  repetitionFactor | n1 | n1 | n1 |  |
| freqDomainPosition | 0 | 0 | 0 |  |
| freqDomainShift | 0 | 0 | 0 |  |
| freqHopping  c-SRS | 14 for test configuration 1,2  25 for test configuration 3 | 25 | 14 | Matches NRB,c |
| freqHopping  b-SRS | 0 | 0 | 0 |  |
| freqHopping  b-hop | 0 | 0 | 0 |  |
| groupOrSequenceHopping | Neither | Neither | Neither |  |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p | sl1, 0 | sl640, 5 | sl320, 3 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | 0 | Any 10 bit number |

Table A.6.4.1.1.1-4: Void

##### A.6.4.1.1.2 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.6.4.1.1.1-1.

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 of the first detected path of DL SSB.

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

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.6.4.1.1.2-1

Table A.6.4.1.1.2-1: 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 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

A.6.4.2 UE timer accuracy

A.6.4.3 Timing advance

#### A.6.4.3.1 SA FR1 timing advance adjustment accuracy

##### A.6.4.3.1.1 Test Purpose and Environment

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

##### A.6.4.3.1.2 Test Parameters

Supported test configurations are shown in 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.

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 7.3.2.1, the UE adjusts its uplink timing at slot n+k+1 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.

Table A.6.4.3.1.2-1: Timing advance 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.6.4.3.1.2-2: General test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF channel number |  | 1 |  |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | For 15 kHz SCS *NTA\_new = NTA\_old + 8192\*Tc*  For 30 kHz SCS *NTA\_new = NTA\_old + 4096\*Tc*  (based on equation in clause 4.2 of TS 38.213 [3]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

Table A.6.4.3.1.2-3: Cell specific test parameters for timing advance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test1** | |
| **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 | MHz | 10: NRB,c = 52 | |
| Config 2 | 10: NRB,c = 52 | |
| Config 3 | 40: NRB,c = 106 | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | |
| Config 2 | 10: NRB,c = 52 | |
| Config 3 | 40: NRB,c = 106 | |
| DRx Cycle | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | |
| Config 2 | SR.1.1 TDD | |
| Config 3 | SR.2.1 TDD | |
| 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 | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | |
| Config 2 |  | TRS.1.1 TDD | |
| Config 3 |  | TRS.1.2 TDD | |
| OCNG Patterns | | |  | OCNG pattern 1 | |
| SMTC configuration | | Config 1,2 |  | SMTC.1 FR1 | |
| Config 3 | SMTC.2 FR1 | |
| SSB configuration | | Config 1,2 |  | SSB.1 FR1 | |
| Config 3 |  | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
| Config 3 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
| Config 3 | 30 kHz | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | |
| Config 3 | | -95 | |
|  | | | dB | 3 | |
|  | | | dB | 3 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -67.57 | |
| Config 3 | | dBm/  38.16MHz | -62.58 | |
| Propagation condition | | | - | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table A.6.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | | **Value** | **Comment** |
| c-SRS | Config 1,2 | 12 | Frequency hopping is disabled |
| Config 3 | 24 |
| b-SRS | | 0 |
| b-hop | | 0 |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5=2 for SCS 15kHz sl5=4 for SCS 30kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 |
| repetitionFactor | | n1 |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | | |

##### A.6.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. *k+1* 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 7.3.2.2.

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

## A.6.5 Signalling characteristics

A.6.5.1 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 intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

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

##### A.6.5.1.1.1 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 8.1.

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.6.5.1.1.1-1. The test parameters are given in Tables A.6.5.1.1.1-2, A.6.5.1.1.1-3, and A.6.5.1.1.1-4 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.6.5.1.1.1-1 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.

Table A.6.5.1.1.1-1: 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.6.5.1.1.1-2: 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 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.6.5.1.1.1-3: 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 | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The 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.6.5.1.1.1-1.  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.6.5.1.1.1-4: 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 | |

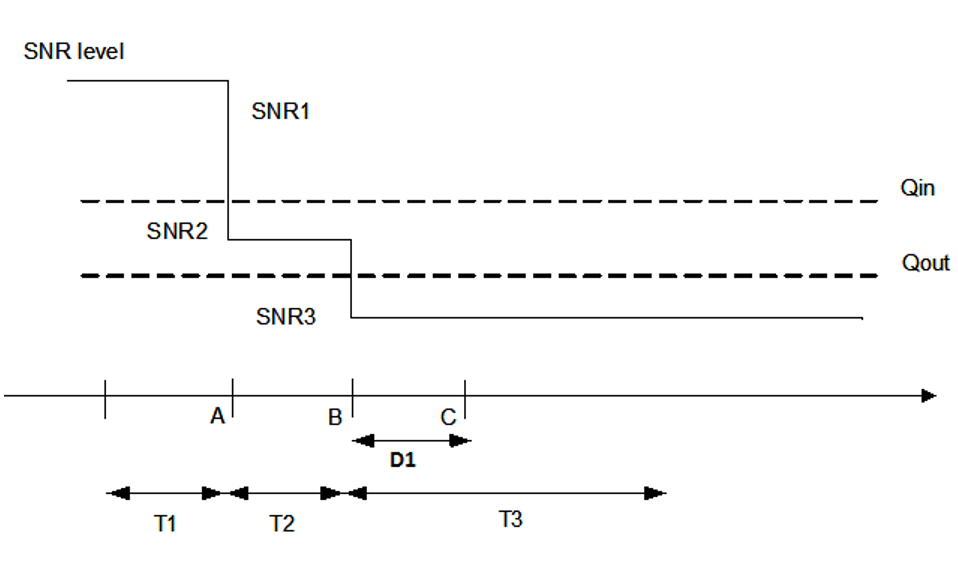


Figure A.6.5.1.1.1-1: SNR variation for out-of-sync testing

##### A.6.5.1.1.2 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.6.5.1.2 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.6.5.1.2.1 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 8.1.

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.6.5.1.2.1-1. The test parameters are given in Tables A.6.5.1.2.1-2, and A.6.5.1.2.1-3 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.6.5.1.2.1-1 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.

Table A.6.5.1.2.1-1: 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.6.5.1.2.1-2: 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 |
| n 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 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.24 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| D1 | | | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

Table A.6.5.1.2.1-3: 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 | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The 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.6.5.1.2.1-1.  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.6.5.1.2.1-4: Void

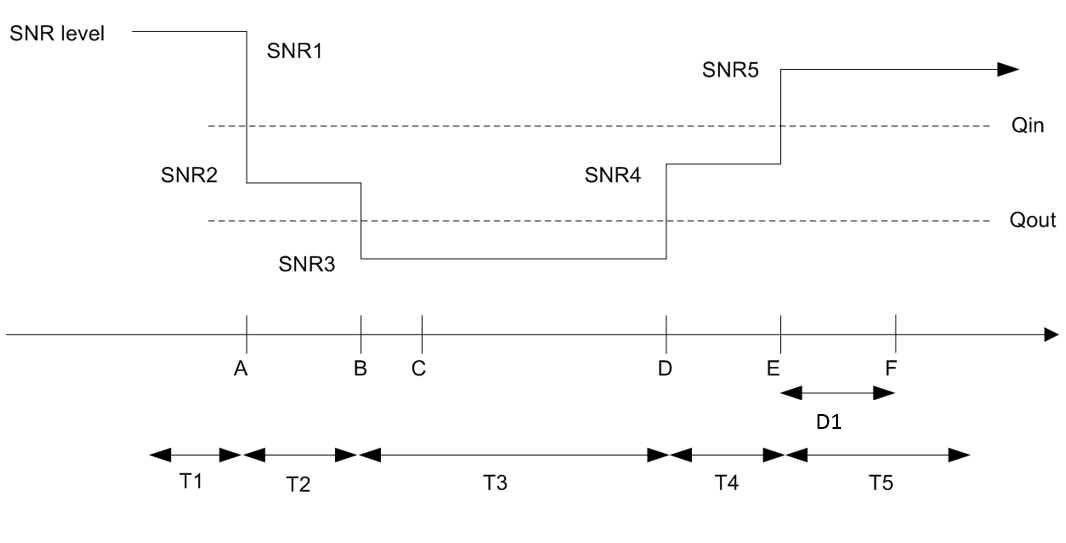


Figure A.6.5.1.2.1-1: SNR variation for in-sync testing

##### A.6.5.1.2.2 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.6.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

##### A.6.5.1.3.1 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 when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

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.6.5.1.3.1-1. The test parameters are given in Tables A.6.5.1.3.1-2, and A.6.5.1.3.1-3. 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.6.5.1.3.1-1 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. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.6.5.1.3.1-1: 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.6.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in 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 Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1 |  | 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 | | | s | 0.2 |
| T2 | | | s | 0.68 |
| T3 | | | s | 0.68 |
| D1 | | | s | 0.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.6.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | |
| **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | 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 | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The 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.6.5.1.3.1-1.  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.6.5.1.3.1-4: Void

Table A.6.5.1.3.1-5: Void

Table A.6.5.1.3.1-6: Void

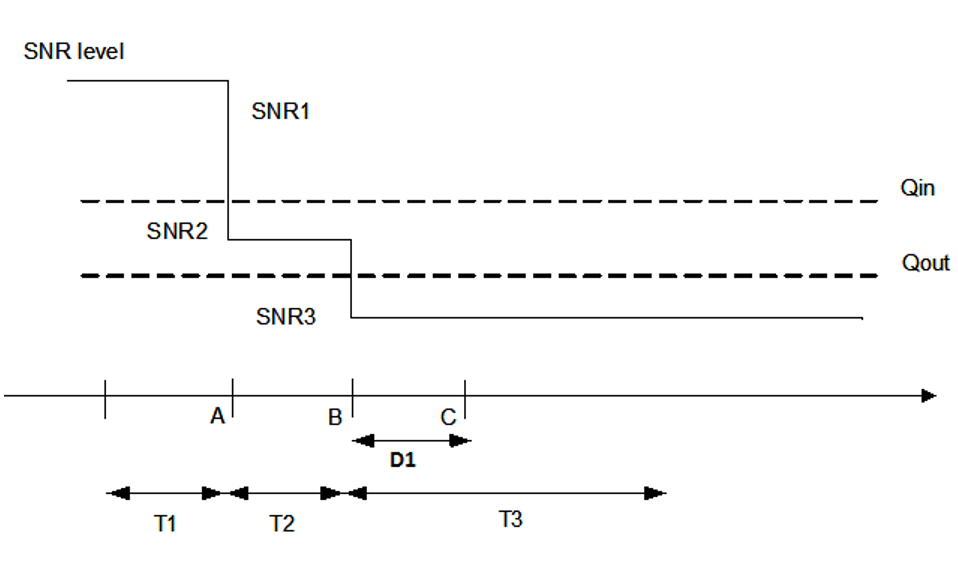


Figure A.6.5.1.3.1-1: SNR variation for out-of-sync testing

##### A.6.5.1.3.2 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.6.5.1.4 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

##### A.6.5.1.4.1 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 when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

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.6.5.1.4.1-1. The test parameters are given in Tables A.6.5.1.4.1-2, and A.6.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 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. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.6.5.1.4.1-1: 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.6.5.1.4.1-2: General test parameters for FR1 in-sync testing in 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 Configuration | | | |  | DRX.3 |
| Gap pattern ID | | | |  | N.A. |
| Layer 3 filtering | | | |  | *Enabled* |
| T310 timer | | | | ms | 2000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1 | |  | 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 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.64 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| D1 | | | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

Table A.6.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1 | 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 | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The 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.6.5.1.4.1-1.  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.6.5.1.4.1-4: Void

Table A.6.5.1.4.1-5: Void

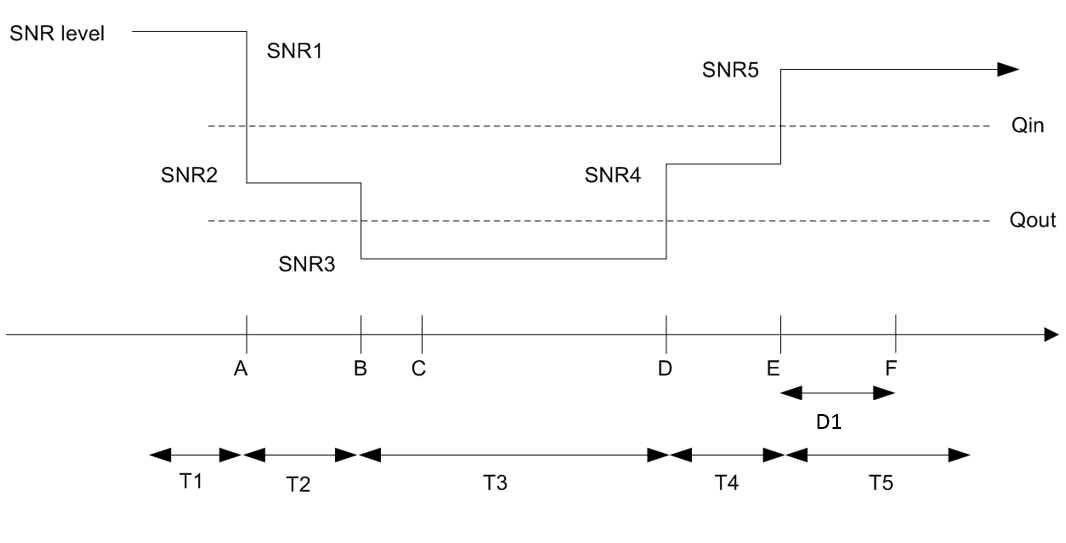


Figure A.6.5.1.4.1-1: SNR variation for in-sync testing.

##### A.6.5.1.4.2 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 (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.6.5.1.5 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

##### A.6.5.1.5.1 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.6.5.1.5.1-1, A.6.5.1.5.1-2, A.6.5.1.5.1-3, and A.6.5.1.5.1-3A 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.6.5.1.5.1-1 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.

Table A.6.5.1.5.1-1: 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.6.5.1.5.1-2: 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 | 0.88 |
| T3 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.6.5.1.5.1-3: 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 SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| 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 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.5.1-1.  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.6.5.1.5.1-3A: 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.6.5.1.5.1-4: Void



Figure A.6.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

##### A.6.5.1.5.2 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.6.5.1.6 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

##### A.6.5.1.6.1 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.6.5.1.6.1-1, A.6.5.1.6.1-2, and A.6.5.1.6.1-3 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.6.5.1.6.1-1 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.

Table A.6.5.1.6.1-1: 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.6.5.1.6.1-2: 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.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 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.6.5.1.6.1-3: 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 SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| 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/15kHz | -98 | | | | |
| Config 2 | -98 | | | | |
| Config 3 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.6.1-1.  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 section A.3.6.1.1. | | | | | | | |

Table A.6.5.1.6.1-4: Void

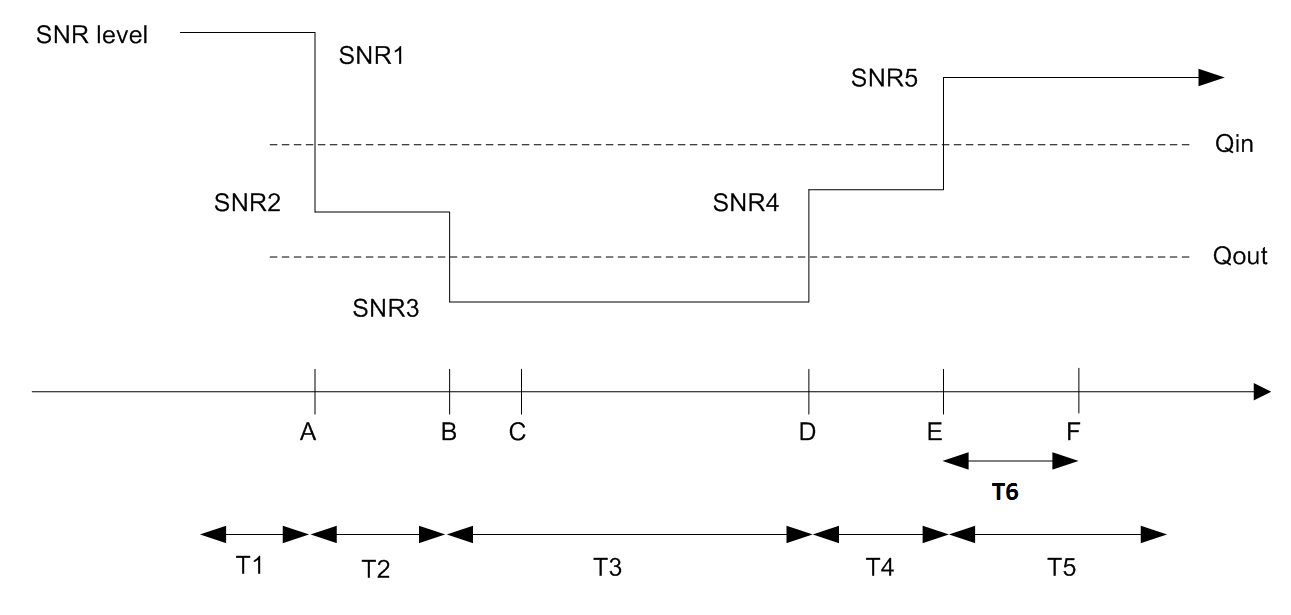


Figure A.6.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

##### A.6.5.1.6.2 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.6.5.1.7 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

##### A.6.5.1.7.1 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 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.6.5.1.7.1-1, A.6.5.1.7.1-2, and A.6.5.1.7.1-3 below. There is one cell, cell 1 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.6.5.1.7.1-1 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 enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.7.1-1: 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.6.5.1.7.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in 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.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 CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1 |  | 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 | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.6.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
| T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| 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 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in section A.3.6.1.1. | | | | | |

Table A.6.5.1.7.1-4: Void

Table A.6.5.1.7.1-5: Void

Table A.6.5.1.7.1-6: Void



Figure A.6.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

##### A.6.5.1.7.2 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 (PCell) 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 (PCell) 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.6.5.1.8 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

##### A.6.5.1.8.1 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 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.6.5.1.8.1-1, A.6.5.1.81-2, A.6.5.1.8.1-3 and A.6.5.1.8.1-3A 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.6.5.1.8.1-1 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. 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.

Table A.6.5.1.8.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| **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.6.5.1.8.1-2: 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.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 CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | gp0 |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 4000 |
| 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 | 1.24 |
| T4 | | s | 0.2 |
| T5 | | s | 4 |
| T6 | | s | 3.88 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.6.5.1.8.1-3: 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 SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| 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/15kHz | -98 | | | | |
| Config 2 | -98 | | | | |
| Config 3 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.8.1-1.  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 section A.3.6.1.1[A.3.6]. | | | | | | | |

Table A.6.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in non-DRX mode

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

Table A.6.5.1.8.1-4: Void

Table A.6.5.1.8.1-5: Void

Table A.6.5.1.8.1-6: Void

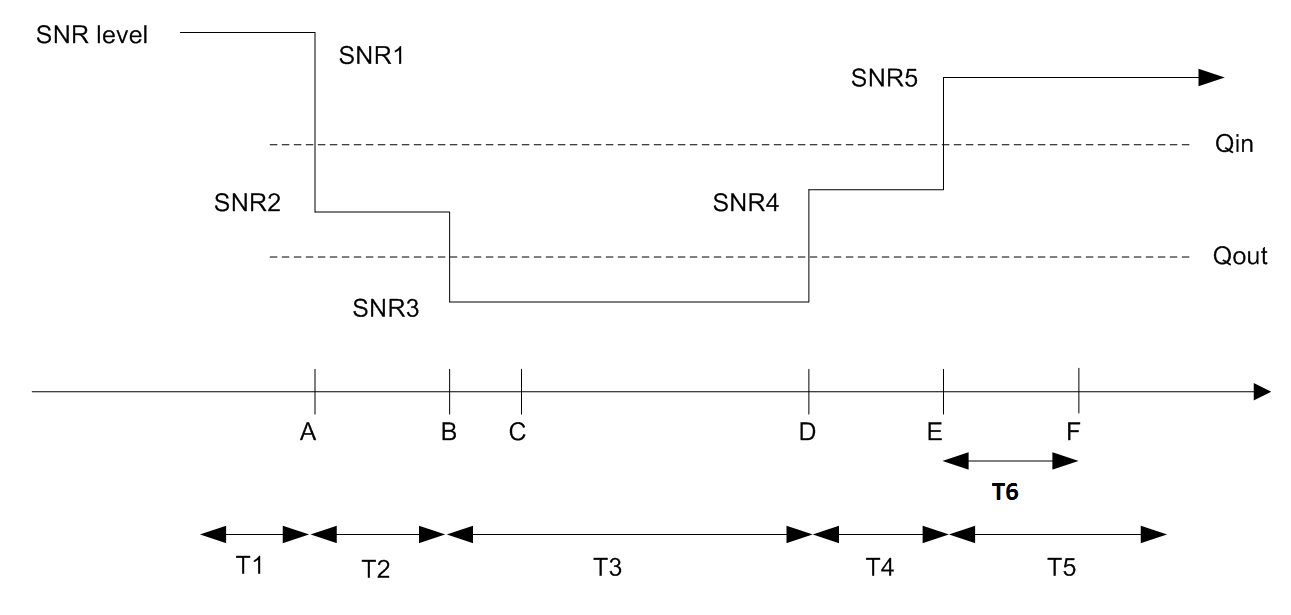


Figure A.6.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

##### A.6.5.1.8.2 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.6.5.2 Interruption

#### A.6.5.2.1 Interruptions during measurements on deactivated NR SCC in FR1

A.6.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations for NR PCell are shown in table A.6.5.2.1.1-1. Supported test configurations for NR SCell are shown in table A.6.5.2.1.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

The general test parameters and NR cell specific test parameters are given in Table A.6.5.2.1.1-2, A.6.5.2.1.1-3 and A.6.5.2.1.1-4 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, PCell is continuously scheduled in DL.

Table A.6.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations for NR PCell

|  |  |
| --- | --- |
| 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: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.6.5.2.1.1-1A: Interruptions during measurements on deactivated NR SCC supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | 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: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.6.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | Two NR RF channels |
| Active PCell |  | Cell1 | PCell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell2 | Deactivated SCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell2 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.6.5.2.1.1-3: NR cell specific test parameters for NR PCell for interruptions during measurements on deactivated NR SCC in standalone NR

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell1** |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1 |  | FDD |
| Config 2,3 | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
| Config 2 | TDDConf.1.1 |
|  | Confiq 3 |  | TDDConf.2.1 |
| BWchannel | Config 1,2 |  | Note 9 |
| Config 3 | Note 9 |
| BWoccupied | Config 1,2 | RB | 52 Note 7 |
|  | Config 3 |  | 106 Note 8 |
| Initial DL BWP Configuration | Config 1,2,3 |  | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,2,3 |  | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,2,3 |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,2,3 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD |
| Config 2 | SR.1.2 TDD |
| Config 3 | SR.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 |
| 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.1.1 FDD |
| Config 2 | CCR.1.1 TDD |
| Config 3 | CCR.2.1 TDD |
| OCNG Patterns | Config 1,2 |  | OP.1Note 7 |
|  | Config 3 |  | OP.1 Note 8 |
| SMTC Configuration | |  | SMTC.1 |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| NocNote 2 | Config 1,2 | dBm/SCS | -104 |
| Config 3 | -101 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -58.96 |
| Config 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 5 | | μs | - |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 9: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table A.6.5.2.1.1-4: NR cell specific test parameters for NR SCell for interruptions during measurements on deactivated NR SCC in standalone NR

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
|  | ConfiqSCell 3 |  | TDDConf.2.1 |
| BWchannel | ConfigSCell 1,2 |  | Note 9 |
| ConfigSCell 3 | Note 9 |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 7 |
|  | ConfigSCell 3 |  | 106 Note 8 |
| Initial DL BWP Configuration | ConfigSCell 1,2,3 |  | DLBWP.0.1 |
| Dedicated DL BWP Configuration | ConfigSCell 1,2,3 |  | DLBWP.1.1 |
| Initial UL BWP Configuration | ConfigSCell 1,2,3 |  | N/A |
| Dedicated UL BWP Configuration | Config 1,2,3 |  | N/A |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | SR.1.1 FDD |
| ConfigSCell 2 | SR.1.2 TDD |
| ConfigSCell 3 | SR.2.1 TDD |
| CSI-RS for tracking | ConfigSCell 1 |  | TRS.1.1 FDD |
|  | ConfigSCell 2 |  | TRS.1.1 TDD |
|  | ConfigSCell 3 |  | TRS.1.2 TDD |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR.2.1 TDD |
| Dedicated CORESET parameters | ConfigSCell 1 |  | CCR.1.1 FDD |
| ConfigSCell 2 | CCR.1.1 TDD |
| ConfigSCell 3 | CCR.2.1 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 7 |
|  | ConfigSCell 3 |  | OP.1 Note 8 |
| SMTC Configuration | |  | SMTC.4 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.5 FR1 |
| ConfigSCell 3 | SSB.6 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| NocNote 2 | ConfigSCell 1,2 | dBm/SCS | -104 |
| ConfigSCell 3 | -101 |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 5 | | μs | 3 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 9: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

A.6.5.2.1.2 Test Requirements

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-1.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-2.

Table A.6.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

Table A.6.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

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

A.6.5.3 SCell Activation and Deactivation Delay

#### A.6.5.3.1 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160ms SCell measurement cycle

##### A.6.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations for NR PCell are shown in table A.6.5.3.1.1-1 below. Supported test configurations for NR SCell are shown in table A.6.5.3.1.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently. The test parameters are given in Tables A.6.5.3.1.1-2 and cell-specific parameters in A.6.5.3.1.1-3 and A.6.5.3.1.1-4 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot , as defined in clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot to , as defined in clause 8.3, where is the interruption length given in section 8.2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot , as defined in clause 8.3, and The starting point of any PCell interruption due to the deactivation shall occur in the slot to , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.6.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations for NR PCell

|  |  |
| --- | --- |
| **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  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.6.5.3.1.1-1A: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations for NR SCell

|  |  |
| --- | --- |
| **ConfigSCell** | **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  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.6.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell2 timing offset to cell1 | μs | 0 |  |
| Time alignment error between cell2 and cell1 | μs | ≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| THARQ | ms | Config 1: 2  Config 2: 3  Config 3: 2.5 | k1NR slot length  k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [3] that will meet the timing constraints of this test case. |
| TCSI\_Reporting | ms | 15 | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2] |

Table A.6.5.3.1.1-3: Cell specific test parameters for NR PCell for known FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | |
| T1 | T2 | T3 |
| 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 | Note 7 | | |
| Config 3 | Note 7 | | |
| BWoccupied | Config 1,2 | RB | 52 Note 5 | | |
|  | Config 3 |  | 106 Note 6 | | |
| Initial BWP configuration | |  | DLBWP.0.1 | | |
| TCI state | |  | TCI.State.0 | | |
| TRS Configuration | Config 1 |  | TRS.1.1 FDD | | |
| Config 2 | TRS.1.1 TDD | | |
| Config 3 | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | | |
| Config 2 | SR.1.1 TDD | | |
| Config 3 | SR.2.1 TDD | | |
| Dedicated CORESET parameters | Config 1 |  | CCR.1.1 FDD | | |
| Config 2 | CCR.1.1 TDD | | |
| Config 3 | CCR.2.1 TDD | | |
| RMSI CORESET parameters | Config 1 |  | CR.1.1 FDD | | |
| Config 2 | CR.1.1 TDD | | |
| Config 3 | CR.2.1 TDD | | |
| OCNG Patterns | Config 1,2 |  | OP.1Note 5 | | |
|  | Config 3, |  | OP.1 Note 6 | | |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 | | |
| Config 3 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting (Note 8) | Config 1 |  | CSI-RS.1.1 FDD | | |
| Config 2 |  | CSI-RS.1.1 TDD | | |
| Config 3 |  | CSI-RS.2.1 TDD | | |
| SMTC configuration | |  | SMTC.1 | | |
| reportConfigType | |  | periodic | | |
| reportQuantity | |  | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | |
| Config 3 | 10 | | |
| CSI reporting offset | Config 1,2 | slot | 3 | | |
| Config 3 | 5 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | Config 1,2 | dBm/SCS | -104 | | |
| Config 3 | -101 | | |
|  | | dB | 17 | | |
|  | | dB | 17 | | |
| SS-RSRPNote3 | Config 1,2 | dBm/SCS | -87 | | |
| Config 3 | -84 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87 | | |
| Io Note3 | Config 1,2 | dBm/  9.36MHz | -58.96 | | |
| Config 3 | dBm/  38.16MHz | -52.87 | | |
| Propagation condition | | - | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel.  Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 cl. 5.2.2.5. | | | | | |

Table A.6.5.3.1.1-4: Cell specific test parameters for NR SCell for known FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | |
| T1 | T2 | T3 |
| Duplex mode | ConfigSCell 1 |  | FDD | | |
| ConfigSCell 2,3 | TDD | | |
| TDD configuration | ConfigSCell 1 |  | Not applicable | | |
| ConfigSCell 2 | TDDConf.1.1 | | |
| ConfigSCell 3 | TDDConf.2.1 | | |
| BWchannel | ConfigSCell 1,2 | MHz | Note 7 | | |
| ConfigSCell 3 | Note 7 | | |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 5 | | |
|  | ConfigSCell 3 |  | 106 Note 6 | | |
| Initial BWP configuration | |  | DLBWP.0.1 | | |
| TCI state | |  | TCI.State.0 | | |
| TRS Configuration | ConfigSCell 1 |  | TRS.1.1 FDD | | |
| ConfigSCell 2 | TRS.1.1 TDD | | |
| ConfigSCell 3 | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | N/A | | |
| ConfigSCell 2 | N/A | | |
| ConfigSCell 3 | N/A | | |
| Dedicated CORESET parameters | ConfigSCell 1 |  | N/A | | |
| ConfigSCell 2 | N/A | | |
| ConfigSCell 3 | N/A | | |
| RMSI CORESET parameters | ConfigSCell 1 |  | N/A | | |
| ConfigSCell 2 | N/A | | |
| ConfigSCell 3 | N/A | | |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1Note 5 | | |
|  | ConfigSCell 3, |  | OP.1 Note 6 | | |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 | | |
| ConfigSCell 3 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting Note 8 | ConfigSCell 1 |  | CSI-RS.1.1 FDD | | |
| ConfigSCell 2 |  | CSI-RS.1.1 TDD | | |
| ConfigSCell 3 |  | CSI-RS.2.1 TDD | | |
| SMTC configuration | |  | SMTC.1 | | |
| reportConfigType | |  | N/A | | |
| reportQuantity | |  | N/A | | |
| CSI reporting periodicity | ConfigSCell 1,2 | slot | N/A | | |
| ConfigSCell 3 | N/A | | |
| CSI reporting offset | ConfigSCell 1,2 | slot | N/A | | |
| ConfigSCell 3 | N/A | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | ConfigSCell 1,2 | dBm/SCS | -104 | | |
| ConfigSCell 3 | -101 | | |
|  | | dB | 17 | | |
|  | | dB | 17 | | |
| SS-RSRPNote3 | ConfigSCell 1,2 | dBm/SCS | -87 | | |
| ConfigSCell 3 | -84 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87 | | |
| Io Note3 | ConfigSCell 1,2 | dBm/  9.36MHz | -58.96 | | |
| ConfigSCell 3 | dBm/  38.16MHz | -52.87 | | |
| Propagation condition | | - | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel.  Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 cl. 5.2.2.5. | | | | | |

##### A.6.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption.During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot , Tactivation\_time = TFirstSSB+ 5ms, as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot , as defined in clause 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot to , as defined in clause 8.3.

During T3 the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot to , as defined in clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

#### A.6.5.3.2 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 640 ms SCell measurement cycle

##### A.6.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1. The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.6.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-1.

Table A.6.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 640 ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |

##### A.6.5.3.2.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except Tactivation\_time will be replaced with the value TFirstSSB\_MAX + Trs + 5ms.

#### A.6.5.3.3 SCell Activation and deactivation of unknown SCell in FR1 in non-DRX

##### A.6.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.6.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.6.5.3.1.1-1. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot , as defined in clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot to , as defined in clause 8.3, where is the interruption length given in section 8.2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot , as defined in clause 8.3, and the starting point of any PCell interruption due to the deactivation shall occur in the slot to , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.6.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| T1 | ms | 100 | During this time the PSCell shall be known and the SCell configured, but not detected. |

##### A.6.5.3.3.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except Tactivation\_time will be replaced with the value TFirstSSB\_MAX + TSMTC\_MAX + 2\*Trs + 5ms as defined in clause 8.3.

A.6.5.4 UE UL carrier RRC reconfiguration Delay

#### A.6.5.4.1 UE UL carrier RRC reconfiguration Delay

Table A.6.5.4.1-1 - Table A.6.5.4.1-4 : Void

##### A.6.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB.* The test parameters for PCell and SCell are given in Table A. 6.5.4.1.1-1, Table A.6.5.4.1.1-2, Table A.6.5.4.1.1-3 and Table A.6.5.4.1.1-4 below. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE*.* At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 2 is configured to UE*.* At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.6.5.4.1.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| **Configuration** | **PCell (Cell 1)** | **SCell (Cell 2)** |
| 1 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15 kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 2 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15 kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 3 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 4 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15 kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 5 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15 kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 6 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 7 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15 kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 8 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15 kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 9 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | | |

Table A.6.5.4.1.1-2: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 1, 2 | Two radio channels are used for these two tests. |
| Active cell |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Cell 1: FR1 PCell  Cell 2: FR1 SCell | PCell on RF channel number 1  FR1 SCell on RF channel number 2 |
| CP length |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Normal |  |
| DRX |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF |  |
| Measurement gap pattern Id |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF |  |
| Filter coefficient |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 0 | L3 filtering is not used |
| T1 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 |  |
| T2 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 |  |
| T3 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 |  |

Table A.6.5.4.1.1-3: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test Configuration** | **Test 1** | | | **Test 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Channel number |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 | | | 1 | | |
| TDD configuration |  | Conf 1, 2, 3 | N/A | | | N/A | | |
| Conf 4, 5, 6 | TDD Conf.1.1 | | | TDD Conf.1.1 | | |
| Conf 7, 8, 9 | TDD Conf.2.1 | | | TDD Conf.2.1 | | |
| BWchannel | MHz | Conf 1, 2, 3 | Note 6 | | | Note 6 | | |
| Conf 4, 5, 6 | Note 6 | | | Note 6 | | |
| Conf 7, 8, 9 | Note 6 | | | Note 6 | | |
| BWoccupied | RB | Conf 1, 2, 3 | 52 Note 4 | | | 52 Note 4 | | |
|  |  | Conf 4, 5, 6 | 52 Note 4 | | | 52 Note 4 | | |
|  |  | Conf 7, 8, 9 | 106 Note 5 | | | 106 Note 5 | | |
| PDSCH reference measurement channel as defined in A.3.1.1 |  | Conf 1, 2, 3 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| Conf 4, 5, 6 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| Conf 7, 8, 9 | SR 2.1 TDD | | | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |  | Conf 1, 2, 3 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Conf 4, 5, 6 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| Conf 7, 8, 9 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.3.1.3 |  | Conf 1, 2, 3 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| Conf 4, 5, 6 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| Conf 7, 8, 9 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 |  | Conf 1, 2, 3, 4, 5, 6 | OP.1 Note 4 | | | OP.1 Note 4 | | |
|  |  | Config 7, 8, 9 | OP.1 Note 5 | | | OP.1 Note 5 | | |
| SSB configuration |  | Conf 1, 2, 3, 4, 5, 6 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| Conf 7, 8, 9 | SSB.2 FR1 | | | SSB.2 FR1 | | |
| SMTC configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | | SMTC.1 | | |
| CSI-RS for tracking |  | Conf 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | Conf 2 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | Conf 3 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | Conf 4 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | Conf 5 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | Conf 6 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | Conf 7 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
|  | Conf 8 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
|  | Conf 9 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| DL initial BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | | DLBWP.1.1 | | |
| UL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | | -102 | | |
| dBm/ SCS | Conf 1,2,3,4,5,6 | -102 | | | -102 | | |
| Conf 7,8,9 | -99 | | | -99 | | |
|  | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1,2,3,4,5,6 | -86 | -86 | -86 | -86 | -86 | -86 |
| Conf 7,8,9 | -83 | -83 | -83 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1,2,3,4,5,6 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 |
| dBm/ 38.16MHz | Conf 7,8,9 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | | AWGN | | |
| Antenna configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | | 1 x 2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | | | | |

Table A.6.5.4.1.1-4: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test Configuration** | **Test 1** | | | | **Test 2** | | |
| **T1** | **T2** | | **T3** | **T1** | **T2** | **T3** |
| Channel number |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2 | | | | 2 | | |
| TDD configuration |  | Conf 1, 4, 7 | N/A | | | | N/A | | |
| Conf 2, 5, 8 | TDDConf.1.1 | | | | TDDConf.1.1 | | |
| Conf 3, 6, 9 | TDDConf.2.1 | | | | TDDConf.2.1 | | |
| BWchannel | MHz | Conf 1, 4, 7 | Note 6 | | | | Note 6 | | |
| Conf 2, 5, 8 | Note 6 | | | | Note 6 | | |
| Conf 3, 6, 9 | Note 6 | | | | Note 6 | | |
| BWoccupied | RB | Conf 1, 4, 7 | 52 Note 4 | | | | 52 Note 4 | | |
|  |  | Conf 2, 5, 8 | 52 Note 4 | | | | 52 Note 4 | | |
|  |  | Conf 3, 6, 9 | 106 Note 5 | | | | 106 Note 5 | | |
| PUSCH parameters for NR UL carrier |  | Conf 1, 4, 7 | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | | N/A | G-FR1-A3-10 in [13] | N/A |
| Conf 2, 5, 8 | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | | N/A | G-FR1-A3-10 in [13] | N/A |
| Conf 3, 6, 9 | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] | | N/A | G-FR1-A3-14 in [13] | N/A |
| PUCCH parameters  For NR UL carrier |  | Conf 1, 4, 7 | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | | N/A | N/A | N/A |
| Conf 2, 5, 8 | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | | N/A | N/A | N/A |
| Conf 3, 6, 9 | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | | N/A | N/A | N/A |
| PUSCH parameters for supplementary UL |  | Conf 1, 4, 7 | N/A | G-FR1-A3-10 in [13] | N/A | | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] |
| Conf 2, 5, 8 | N/A | G-FR1-A3-10 in [13] | N/A | | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] |
| Conf 3, 6, 9 | N/A | G-FR1-A3-14 in [13] | N/A | | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] |
| PUCCH parameters for supplementary UL |  | Conf 1, 4, 7 | N/A | N/A | N/A | | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
| Conf 2, 5, 8 | N/A | N/A | N/A | | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
| Conf 3, 6, 9 | N/A | N/A | N/A | | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] |
| PDSCH reference measurement channel as defined in A.3.1.1 |  | Conf 1, 4, 7 | SR.1.1 FDD | | | | SR.1.1 FDD | | |
| Conf 2, 5, 8 | SR.1.1 TDD | | | | SR.1.1 TDD | | |
| Conf 3, 6, 9 | SR 2.1 TDD | | | | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |  | Conf 1, 4, 7 | CR.1.1 FDD | | | | CR.1.1 FDD | | |
| Conf 2, 5, 8 | CR.1.1 TDD | | | | CR.1.1 TDD | | |
| Conf 3, 6, 9 | CR.2.1 TDD | | | | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.3.1.3 |  | Conf 1, 4, 7 | CCR.1.1 FDD | | | | CCR.1.1 FDD | | |
| Conf 2, 5, 8 | CCR.1.1 TDD | | | | CCR.1.1 TDD | | |
| Conf 3, 6, 9 | CCR.2.1 TDD | | | | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 |  | Conf 1, 2, 4, 5, 7, 8 | OP.1 Note 4 | | | | OP.1 Note 4 | | |
|  |  | Conf 3, 6, 9 | OP.1 Note 5 | | | | OP.1 Note 5 | | |
| SSB configuration |  | Conf 1, 2, 4, 5, 7,8 | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| Conf 3, 6, 9 | SSB.2 FR1 | | | | SSB.2 FR1 | | |
| SMTC configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | | | SMTC.1 | | |
| CSI-RS for tracking |  |  | Conf 1 | | | | TRS.1.1 FDD | | |
|  |  |  | Conf 2 | | | | TRS.1.1 TDD | | |
|  |  |  | Conf 3 | | | | TRS.1.2 TDD | | |
|  |  |  | Conf 4 | | | | TRS.1.1 FDD | | |
|  |  |  | Conf 5 | | | | TRS.1.1 TDD | | |
|  |  |  | Conf 6 | | | | TRS.1.2 TDD | | |
|  |  |  | Conf 7 | | | | TRS.1.1 FDD | | |
|  |  |  | Conf 8 | | | | TRS.1.1 TDD | | |
|  |  |  | Conf 9 | | | | TRS.1.2 TDD | | |
| DL initial BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | | | DLBWP.1.1 | | |
| UL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | | | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | | | -102 | | |
| dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -102 | | | | -102 | | |
| Conf 3, 6, 9 | -99 | | | | -99 | | |
|  | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | | 16 | 16 | 16 | 16 |
| Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | | 16 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -86 | -86 | | -86 | -86 | -86 | -86 |
| Conf 3, 6, 9 | -83 | -83 | | -83 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1, 2, 4, 5, 7,8 | -57.9 | -57.9 | | -57.9 | -57.9 | -57.9 | -57.9 |
| dBm/ 38.16MHz | Conf 3, 6, 9 | -51.8 | -51.8 | | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | | | AWGN | | |
| Antenna configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | | | 1 x 2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | | | | | |

##### A.6.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

#### A.6.5.4.2 Void

A.6.5.5 Beam Failure Detection and Link recovery procedures

#### A.6.5.5.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.6.5.5.1.1 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 8.5.

The test parameters are given in Tables A.6.5.5.1.1-1, A.6.5.5.1.1-2, A.6.5.5.1.1-3 and A.6.5.5.1.1-4 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.6.5.5.1.1-1 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.6.5.5.1.1-1 additionally 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.

Table A.6.5.5.1.1-1: 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.6.5.5.1.1-2: 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 | | | Config 1 |  | CR.1.1 FDD |  |
| Reference Channel | | | Config 2 |  | CR.1.1 TDD |  |
|  | | | Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET | | | Config 1 |  | CCR.1.1 FDD |  |
| Reference Channel | | | 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 | | | Config 1, 2 |  | 15 KHz |  |
| subcarrier spacing | | | Config 3 |  | 30 KHz |  |
| PRACH | | | Config 1, 2 |  | Table A.3.8.2.2-1 |  |
| Configuration | | | 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 | DCI format | | |  | 1-0 |  |
| detection transmission parameters | Number of Control OFDM symbols | | |  | 2 |  |
|  | Aggregation level | | | CCE | 8 |  |
|  | Ratio of hypothetical PDCCH RE energy to average 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/ | -98 | Threshold used for |
|  | | Config 3 | | SCS kHz | -95 | Qin\_LR\_SSB |
| 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 | Config 1 | | |  | CSI-RS.1.1 FDD |  |
| configuration for | Config 2 | | |  | CSI-RS.1.1 TDD |  |
| CSI reporting | Config 3 | | |  | CSI-RS.2.1 TDD |  |
| CSI-RS for | Config 1 | | |  | TRS.1.1 FDD |  |
| tracking | 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 | | | | s | 0.2 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 0.37 |  |
| T3 | | | | s | 0.24 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 0.17 |  |
| D1 | | | | s | 0.13 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | |

Table A.6.5.5.1.1-3: 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/ | -108 | -108 | -88 | -88 | -88 |
|  | Config 2 | SCS kHz | -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 | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 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.6.5.5.1.1-4: Void



Figure A.6.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.6.5.5.1.2 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.6.5.5.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode

##### A.6.5.5.2.1 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 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 8.5.

The test parameters are given in Tables A.6.5.5.2.1-1, A.6.5.5.2.1-2, A.6.5.5.2.1-3, A.6.5.5.2.1-4 and A.6.5.5.2.1-5 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.6.5.5.2.1-1 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.6.5.5.2.1-1 additionally 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 enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.6.5.5.2.1-1: 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.6.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Value | Comment |
|  | | | |  | Test 1 |  |
| Active 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 | | | Config 1 |  | CR.1.1 FDD |  |
| Reference Channel | | | Config 2 |  | CR.1.1 TDD |  |
|  | | | Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET | | | Config 1 |  | CCR.1.1 FDD |  |
| Reference Channel | | | 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 | | DCI format | |  | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols | |  | 2 |  |
|  | | Aggregation level | | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |  |
|  | | DMRS precoder granularity | |  | REG bundle size |  |
|  | | REG bundle size | |  | 6 |  |
| DRX | | | |  | DRX.7 | A.3.3.7 |
| Gap pattern ID | | | |  | N.A. |  |
| rlmInSyncOutOfSyncThreshold | | | |  | Absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB |  | | | dBm/SCS kHz | -98 | Threshold used for |
|  |  | | |  | -95 | Qin\_LR\_SSB |
| 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 | | | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 5.17 |  |
| T3 | | | | s | 3.24 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 1.97 |  |
| D1 | | | | s | 1.93 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | |

Table A.6.5.5.2.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1 | 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/ | -108 | -108 | -88 | -88 | -88 |
|  | Config 2 | SCS kHz | -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 | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 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.6.5.5.2.1-4: Void

Table A.6.5.5.2.1-5: Void



Figure A.6.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.6.5.5.2.2 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 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 = 1920+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.6.5.5.3 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.6.5.5.3.1 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 8.5.

The test parameters are given in Tables A.6.5.5.3.1-1, A.6.5.5.3.1-2, 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.6.5.5.3.1-1 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.6.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery. 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.

Table A.6.5.5.3.1-1: 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.6.5.5.3.1-2: 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 | Config 1 | |  | Not Applicable |  |
| Configuration | Config 2 | |  | TDDConf.1.1 |  |
|  | Config 3 | |  | TDDConf.2.1 |  |
| RMSI CORESET | Config 1 | |  | CR.1.1 FDD | A.3.1.2 |
| Reference | Config 2 | |  | CR.1.1 TDD |  |
| Channel | Config 3 | |  | CR.2.1 TDD |  |
| Dedicated CORESET | Config 1 | |  | CCR.1.1 FDD | A.3.1.3 |
| Reference | Config 2 | |  | CCR.1.1 TDD |  |
| Channel | Config 3 | |  | CCR.2.1 TDD |  |
| SSB | Config 1 | |  | SSB.3 FR1 | A.3.10 |
| Configuration | Config 2 | |  | SSB.3 FR1 |  |
|  | Config 3 | |  | SSB.4 FR1 |  |
| SMTC | Config 1, 2 | |  | SMTC.1 | A.3.11 |
| Configuration | Config 3 | |  | SMTC.1 |  |
| PDSCH/PDC | Config 1, 2 | |  | 15 KHz |  |
| CH subcarrier spacing | Config 3 | |  | 30 KHz |  |
| PRACH Configuration | Config 1, 2, 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 | DCI format | |  | 1-0 |  |
| detection transmission | Number of Control OFDM symbols | |  | 2 |  |
| parameters | 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- | Config 1, 2 | | dBm/ | -98 | Threshold used for |
| ThresholdSSB | Config 3 | | SCS kHz | -95 | Qin\_LR\_SSB |
| 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 | | Config 1 |  | CSI-RS.1.2 FDD | A.3.14 |
| q0 and q1 | | Config 2 |  | CSI-RS.1.2 TDD |  |
|  | | Config 3 |  | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for | | Config 1 |  | CSI-RS.1.1 FDD | A.3.14 |
| CSI reporting | | 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 | | Config 1 |  | CSI-RS.1.2 FDD | A.3.14 |
| as RLM RS | | 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.6.5.5.3.1-3: 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 | Config 1 | dB | 5 | -3 | -12 | -12 | -12 |
| set q0 | Config 2 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_CSI-RS of | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
| set q1 | Config 2 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3 |  | -10 | -10 | 10 | 10 | 10 |
| CSI-RS\_RP of set | Config 1 | dBm/ | -108 | -108 | -88 | -88 | -88 |
| q1 | Config 2 | SCS kHz | -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 | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 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.6.5.5.3.1-4: Void

Table A.6.5.5.3.1-5: Void

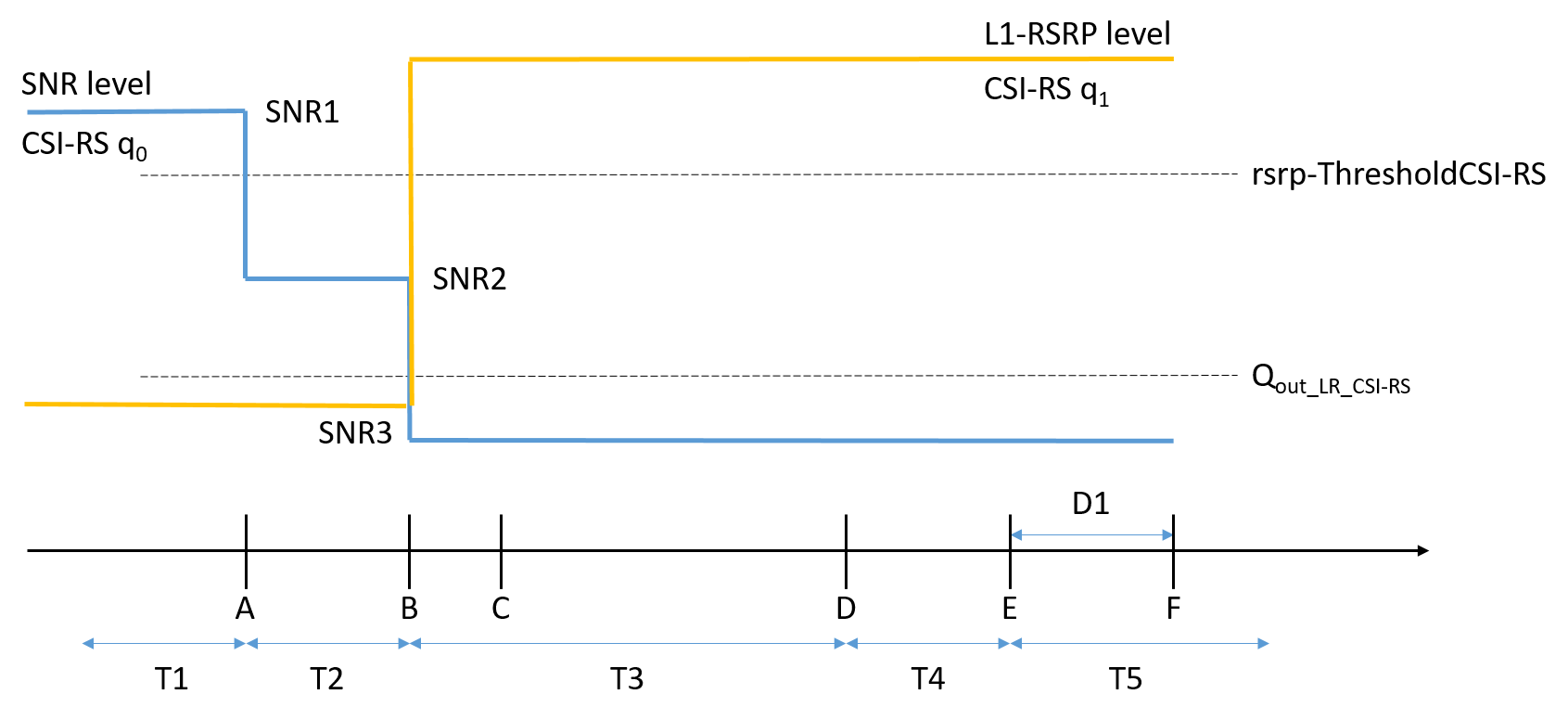


Figure A.6.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

##### A.6.5.5.3.2 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.6.5.5.4 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode

##### A.6.5.5.4.1 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 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 8.5.

The test parameters are given in Tables A.6.5.5.4.1-1, A.6.5.5.4.1-2, A.6.5.5.4.1-3, and A.6.5.5.4.1-4 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.6.5.5.4.1-1 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.6.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.6.5.5.4.1-1: 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, 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.6.5.5.4.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
|  | |  | **Test 1** |  |
| Active PCell | |  | Cell 1 |  |
| RF Channel Number | |  | 1 |  |
| Duplex mode | Config 1 |  | FDD |  |
|  | Config 2, 3 |  | TDD |  |
| TDD | Config 1 |  | Not Applicable |  |
| Configuration | Config 2 |  | TDDConf.1.1 |  |
|  | Config 3 |  | TDDConf..21 |  |
| RMSI CORESET | Config 1 |  | CR.1.1 FDD | A.3.1.2 |
| Reference | Config 2 |  | CR.1.1 TDD |  |
| Channel | Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET | Config 1 |  | CCR.1.1 FDD | A.3.1.3 |
| Reference | Config 2 |  | CCR.1.1 TDD |  |
| Channel | Config 3 |  | CCR.2.1 TDD |  |
| SSB | Config 1 |  | SSB.3 FR1 | A.3.10 |
| Configuration | Config 2 |  | SSB.3 FR1 |
|  | Config 3 |  | SSB.4 FR1 |  |
| SMTC | Config 1, 2 |  | SMTC.1 | A.3.11 |
| Configuration | Config 3 |  | SMTC.1 |  |
| PDSCH/PDCC | Config 1, 2 |  | 15 KHz |  |
| H subcarrier spacing | Config 3 |  | 30 KHz |  |
| PRACH Configuration | Config 1, 2, 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 | DCI format |  | 1-0 |  |
| detection transmission | Number of Control OFDM symbols |  | 2 |  |
| parameters | Aggregation level | CCE | 8 |  |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
|  | DMRS precoder granularity |  | REG bundle size |  |
|  | REG bundle size |  | 6 |  |
| DRX | |  | DRX.7 | A.3.3.7 |
| Gap pattern ID | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ | -98 | Threshold used for |
|  | Config 3 | SCS kHz | -95 | Qin\_LR\_SSB |
| 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 | Config 1 |  | CSI-RS.1.2 FDD | A.3.14  .1 |
| for q0 and q1 | Config 2 |  | CSI-RS.1.2 TDD |  |
|  | Config 3 |  | CSI-RS.2.2 TDD |  |
| CSI-RS | Config 1 |  | CSI-RS.1.1 FDD | A.3.14.1 |
| configuration | Config 2 |  | CSI-RS.1.1 TDD |  |
| for CSI reporting | Config 3 |  | CSI-RS.2.1 TDD |  |
| TRS | Config 1 |  | TRS.1.1 FDD |  |
| configuration | Config 2 |  | TRS.1.1 TDD |  |
|  | Config 3 |  | TRS.1.2 TDD |  |
| CSI-RS-Index | Config 1 |  | CSI-RS.1.2 FDD |  |
| assigned as | Config 2 |  | CSI-RS.1.2 TDD |  |
| RLM RS | Config 3 |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | ms | 1000 |  |
| N310 | |  | 2 |  |
| T1 | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | s | 8.37 |  |
| T3 | | s | 6.44 |  |
| T4 | | s | 0 |  |
| T5 | | s | 1.97 |  |
| D1 | | s | 1.93 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

**Table A.6.5.5.4.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1 | 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 | dB/ | -110 | -110 | -88 | -88 | -88 |
|  | Config 2 | SCS kHz | -110 | -110 | -88 | -88 | -88 |
|  | Config 3 |  | -107 | -107 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 KHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 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.6.5.5.4.1-4: Void

Table A.6.5.5.4.1-5: Void

Table A.6.5.5.4.1-6: Void

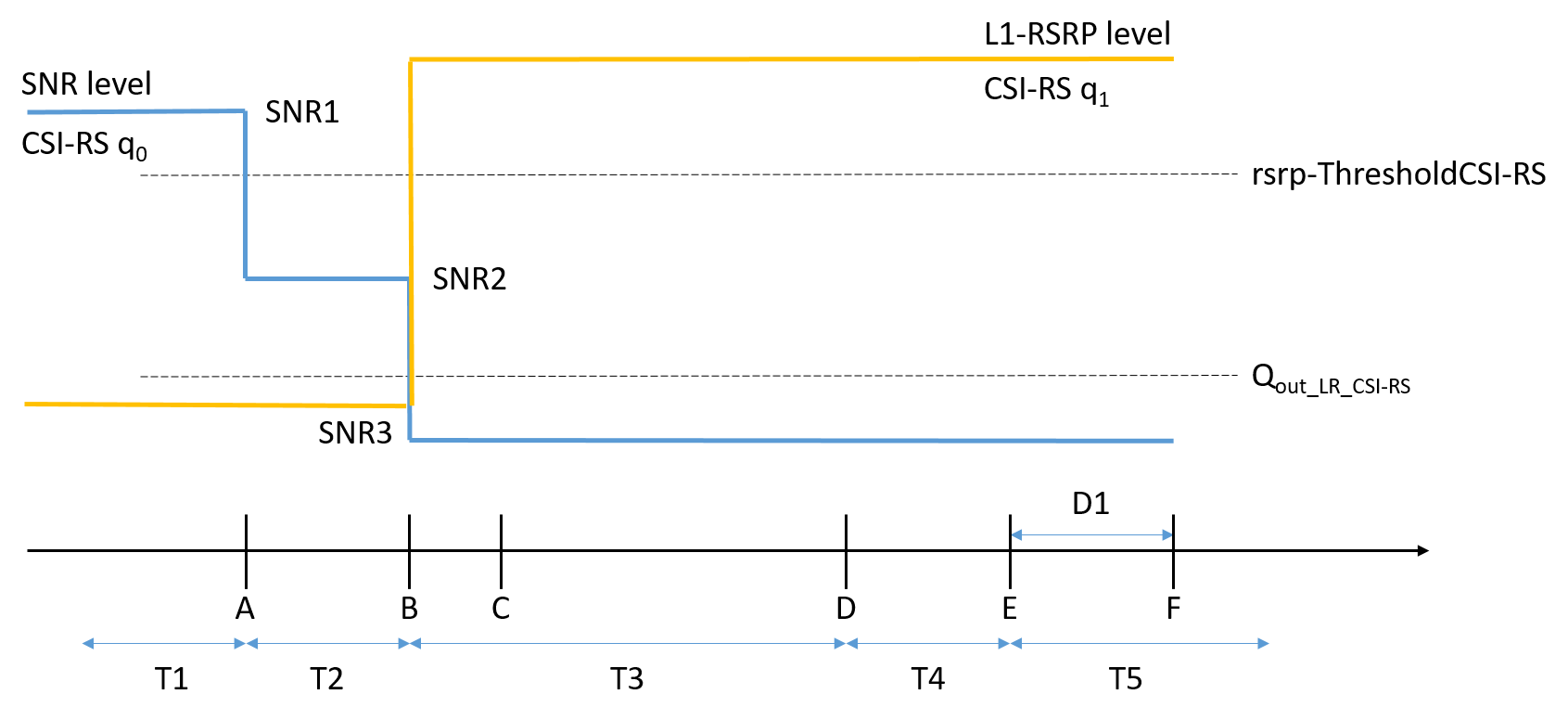


Figure A.6.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

##### A.6.5.5.4.2 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 = 1920+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.6.5.6 Active BWP switch

#### A.6.5.6.1 DCI-based and Timer-based Active BWP Switch

##### A.6.5.6.1.1 NR FR1- NR FR1 DL active BWP switch of SCell with non-DRX in SA

A.6.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations for PCell are shown in Table A.6.5.6.1.1.1-1 below. Supported test configurations for NR SCell are shown in table A.6.5.6.1.1.1-1A below. Test configuration for NR PCell and test configuration for NR SCell are chosen independently. The test scenario comprises of one NR PCell (Cell 1) and one SCell (Cell 2) as given in Table A.6.5.6.1.1.1-2. NR Cell-specific parameters are specified in Table A.6.5.6.1.1.1-3 and Table A.6.5.6.1.1.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

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

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

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

- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.

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

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-0 in PCell.

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

All cells have 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 SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell’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 no later than the first DL slot that occurs after the beginning of SCell’s DL slot (*i+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell no later than the first UL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-2 no later than the first DL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay).

The starting time of PCell (Cell 1) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on SCell (Cell 2).

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 should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell’s slot (*j+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell at latest on the first UL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-1 no later than the first DL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay).

The starting time of PCell (Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

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

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

Table A.6.5.6.1.1.1-1: DL BWP switch supported test configurations for NR PCell

|  |  |
| --- | --- |
| **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: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.6.5.6.1.1.1-1A: DL BWP switch supported test configurations for NR SCell

|  |  |
| --- | --- |
| **ConfigSCell** | **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: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.6.5.6.1.1.1-2: General test parameters for DL BWP switch in SA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1, 2 | Two NR radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active SCell |  | Cell 2 | SCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and SCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | μs | 3 | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

Table A.6.5.6.1.1.1-3: NR Cell specific test parameters for NR PCell 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.1.2 |
| BWchannel | Config 1,2 |  | Note 7 |
|  | Config 3 |  | Note 7 |
| BWoccupied | Config 1,2 | RB | 52 Note 5 |
|  | Config 3 |  | 106 Note 6 |
| Active BWP ID | |  | 0 |
| Initial DL BWP Configuration | |  | DLBWP.0.2Note4 |
| Initial UL BWP Configuration | |  | ULBWP.0.2Note4 |
| Active DL BWP-0 Configuration | |  | DLBWP.0.2Note4 |
| Active DL BWP-1 Configuration | |  | N.A. |
| Active DL BWP-2 Configuration | |  | N.A. |
| Active UL BWP-0 Configuration | |  | ULBWP.0.2Note4 |
| Active UL BWP-1 Configuration | |  | N.A. |
| Active UL BWP-2 Configuration | |  | N.A. |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD |
| measurement channel | Config 2 |  | SR.1.1 TDD |
|  | Config 3 |  | SR.2.1 TDD |
| RMSI CORESET | Config 1 |  | CR.1.1 FDD |
| parameters | Config 2 |  | CR.1.1 TDD |
|  | Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET | Config 1 |  | CCR.1.2 FDD |
| parameters | Config 2 |  | CCR.1.2 TDD |
|  | Config 3 |  | CCR.2.4 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 |  | OP.1 Note 5 |
|  | Config 3 |  | OP.1 Note 6 |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 |
|  | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| 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 | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  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].  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table A.6.5.6.1.1.1-4: NR Cell specific test parameters for NR SCell for DL BWP switch in SA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
|  | ConfigSCell 2,3 |  | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
|  | ConfigSCell 2 |  | TDDConf.1.1 |
|  | ConfigSCell 3 |  | TDDConf.1.2 |
| BWchannel | ConfigSCell 1,2 |  | Note 7 |
|  | ConfigSCell 3 |  | Note 7 |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 5 |
|  | ConfigSCell 3 |  | 106 Note 6 |
| Active BWP ID | |  | 1, 2 |
| Initial DL BWP Configuration | |  | DLBWP.0.2Note4 |
| Initial UL BWP Configuration | |  | N.A. |
| Active DL BWP-0 Configuration | |  | N.A. |
| Active DL BWP-1 Configuration | |  | DLBWP.1.1Note4 |
| Active DL BWP-2 Configuration | |  | DLBWP.1.3Note4 |
| Active UL BWP-0 Configuration | |  | N.A. |
| Active UL BWP-1 Configuration | |  | N.A. |
| Active UL BWP-2 Configuration | |  | N.A. |
| PDSCH Reference | ConfigSCell 1 |  | SR.1.1 FDD |
| measurement channel | ConfigSCell 2 |  | SR.1.1 TDD |
|  | ConfigSCell 3 |  | SR.2.1 TDD |
| RMSI CORESET | ConfigSCell 1 |  | CR.1.1 FDD |
| parameters | ConfigSCell 2 |  | CR.1.1 TDD |
|  | ConfigSCell 3 |  | CR.2.1 TDD |
| Dedicated CORESET | ConfigSCell 1 |  | CCR.1.2 FDD |
| parameters | ConfigSCell 2 |  | CCR.1.2 TDD |
|  | ConfigSCell 3 |  | CCR.2.4 TDD |
| TRS Configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
|  | ConfigSCell 2 |  | TRS.1.1 TDD |
|  | ConfigSCell 3 |  | TRS.1.2 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 5 |
|  | ConfigSCell 3 |  | OP.1 Note 6 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
|  | ConfigSCell 3 |  | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |
| NocNote 2 | ConfigSCell 1,2 | dBm/SCS | -104 |
|  | ConfigSCell 3 |  | -101 |
| NocNote 2 | | dBm/15KHz | -104 |
| SS-RSRP Note 3 | ConfigSCell 1,2 | dBm/SCS | -87 |
|  | ConfigSCell 3 |  | -84 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/  9.36MHz | -58.96 |
|  | ConfigSCell 3 | dBm/  38.16MHz | -52.86 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  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].  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

A.6.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell on 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 SCell on 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 SCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

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

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

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

##### A.6.5.6.1.2 NR FR1 DL active BWP switch with non-DRX in SA

A.6.5.6.1.2.1 Test Purpose and Environment

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

The supported test configurations are shown in Table A.6.5.6.1.2.1-1. The test scenario comprises of one cell (Cell 1) as given in Table A.6.5.6.1.2.1-2. Cell-specific parameters of the cell are specified in Table A.6.5.6.1.2.1-3 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.

**Table A.6.5.6.1.2.1-1: 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.6.5.6.1.1 can skip the test cases in A.6.5.6.1.2. | |

**Table A.6.5.6.1.2.1-2: 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 |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

**Table A.6.5.6.1.2.1-3: 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 | | | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: 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.6.5.6.1.2.2 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%.

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.6.5.6.2 RRC-based Active BWP Switch

##### A.6.5.6.2.1 NR FR1 DL active BWP switch of Cell with non-DRX in SA

A.6.5.6.2.1.1 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 8.6.

The supported test configurations are shown in Table A.6.5.6.2.1.1-1.The test scenario comprises of one Cell (Cell 1) as given in Table A.6.5.6.2.1.1-2. Cell-specific parameters of Cell are specified in Table A.6.5.6.2.1.1-3 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 Cell’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 starting from the the first DL slot that occurs after the beginning of DL slot .

*TRRCprocessingDelay* and *TBWPswitchDelayRRC* are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PCell 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.

**Table A.6.5.6.2.1.1-1: 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 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.6.5.6.2.1.1-2: 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 |  |
| T1 | s | 0.2 |  |

**Table A.6.5.6.2.1.1-3: 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 | | Config 1 |  | SR.1.1 FDD |
| measurement channel | | Config 2 |  | SR.1.1 TDD |
|  | | Config 3 |  | SR2.1 TDD |
| RMSI CORESET | | Config 1 |  | CR.1.1 FDD |
| parameters | | Config 2 |  | CR.1.1 TDD |
|  | | Config 3 |  | CR2.1 TDD |
| Dedicated CORESET | | Config 1 |  | CCR.1.2 FDD |
| parameters | | 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 |
| Antenna Configuration | | |  | 1x2 Low |
| Propagation Condition | | |  | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | |  |  |
| NocNote 2 | | Config 1,2 | dBm/SCS | -104 |
|  | | 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.6.5.6.2.1.2 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 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.6.6 Measurement procedure

A.6.6.1 Intra-frequency Measurements

#### A.6.6.1.1 SA event triggered reporting tests without gap under non-DRX

##### A.6.6.1.1.1 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 9.2.5.1 and 9.2.5.2.

##### A.6.6.1.1.2 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 parameters for PCell and neighbour cell are given in Table A.6.6.1.1.1-1 and A.6.6.1.1.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The 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.

**Table A.6.6.1.1.1.2-1: 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.6.6.1.1.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 |  |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
| 2 | SSB.1 FR1 |  |
| 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| Hysteresis | dB | 1, 2, 3 | 0 |  |
| Time To Trigger | s | 1, 2, 3 | 0 |  |
| Filter coefficient |  | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX |  | 1, 2, 3 |  | OFF |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| 2 | 3 μs | Synchronous cells |
| 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 5 |  |

**Table A.6.6.1.1.2-3: 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** |
| TDD configuration |  | 1 | TN/A | | TN/A | |
| 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
| 2 | SR.1.1 TDD | |
| 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
| 2 | CR.1.1 TDD | | N/A | |
| 3 | CR.2.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
| 2 | CCR.1.1 TDD | | N/A | |
| 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
| 2 | TRS.1.1 TDD | | N/A | |
| 3 | TRS.1.2 TDD | | N/A | |
| IInitial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
| 2 | -98 | | | |
| 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| 2 |
| 3 |
|  | dB | 1 | 4 | 4 | -Infinity | 4 |
| 2 |
| 3 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| 2 | -94 | -94 | -Infinity | -94 |
| 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | --64.60 | -62.25 |
| dBm/9.36 MHz | 2 | -64.60 | -62.25 | --64.60 | -62.25 |
| dBm/38.16 MHz | 3 | -58.50 | -56.16 | --58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.1.1.3 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.

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.6.6.1.2 SA event triggered reporting tests without gap under DRX

##### A.6.6.1.2.1 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 clauses 9.2.5.1 and 9.2.5.2.

##### A.6.6.1.2.2 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 parameters for PCell are given in Table A.6.6.1.2.2-1, A.6.6.1.2.2-2 and A.6.6.1.2.2-3 below. In the measurement controlinformation, 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 needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.1.2.2-1: 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 |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.6.6.1.2.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| Active cell |  | 1, 2, 3 | Cell 1 | |  |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 | |  |
| SSB configuration |  | 1 | SSB.1 FR1 | |  |
| 2 | SSB.1 FR1 | |  |
| 3 | SSB.2 FR1 | |  |
| SMTC configuration |  | 1 | SMTC.2 | |  |
| 2 | SMTC.1 | |  |
| 3 | SMTC.1 | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |  |
| CP length |  | 1, 2, 3 | Normal | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3 | DRX.1 | DRX.7 |  |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| 2 | 3 μs | | Synchronous cells |
| 3 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |  |
| T2 | s | 1, 2, 3 | 5 | 10 |  |

**Table A.6.6.1.2.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | TN/A | | TN/A | |
| 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
| 2 | SR.1.1 TDD | |
| 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
| 2 | CR.1.1 TDD | | N/A | |
| 3 | CR.2.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
| 2 | CCR.1.1 TDD | | N/A | |
| 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | N/A | |
| 2 | TRS.1.1 TDD | | N/A | |
| 3 | TRS.1.2 TDD | | N/A | |
| IInitial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
| 2 | -98 | | | |
| 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| 2 |
| 3 |
|  | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| 2 |
| 3 |
|  | dB | 1 | 4 | 4 | -Infinity | 4 |
| 2 |
| 3 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| 2 | -94 | -94 | -Infinity | -94 |
| 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | --64.60 | -62.25 |
| dBm/9.36 MHz | 2 | -64.60 | -62.25 | --64.60 | -62.25 |
| dBm/38.16 MHz | 3 | -58.50 | -56.16 | --58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.1.2.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

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

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

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

#### A.6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX

##### A.6.6.1.3.1 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 intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

##### A.6.6.1.3.2 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 parameters for PCell are given in Table A.6.6.1.3.1-1 and A.6.6.1.3.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The 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.

**Table A.6.6.1.3.2-1: 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 |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.6.6.1.3.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 |  |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| Measurement gap type |  | 1, 2, 3 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3 | 40 |  |
| Measurement gap length | ms | 1, 2, 3 | 6 |  |
| Measurement gap offset | ms | 1, 2, 3 | 39 |  |
| 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 |  |
| CSI-RS parameters |  | 1 | CSI-RS.1.2 FDD resource #0 |  |
|  |  | 2 | CSI-RS.1.2 TDD resource #0 |  |
|  |  | 3 | CSI-RS.2.2 TDD resource #0 |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| Hysteresis | dB | 1, 2, 3 | 0 |  |
| Time To Trigger | s | 1, 2, 3 | 0 |  |
| Filter coefficient |  | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3 |  | OFF |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |  | 2 | 3 μs | Synchronous cells |
|  |  | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 5 |  |

**Table A.6.6.1.3.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Cell 1 | | Cell 2 | |
|  |  | configuration | T1 | T2 | T1 | T2 |
| TDD |  | 1 | TN/A | | TN/A | |
| configuration |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | N/A | |
| configuration |  | 2 | SR.1.1 TDD | |  | |
|  |  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | N/A | |
| RMC |  | 2 | CR.1.1 TDD | | N/A | |
| configuration |  | 3 | CR.2.1 TDD | | N/A | |
| Dedicated |  | 1 | CCR.1.1 FDD | | N/A | |
| CORESET RMC |  | 2 | CCR.1.1 TDD | | N/A | |
| configuration |  | 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS |  | 1 | TRS.1.1 FDD | | N/A | |
| configuration |  | 2 | TRS.1.1 TDD | | N/A | |
|  |  | 3 | TRS.1.2 TDD | | N/A | |
| IInitial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  |  | 2 | -98 | | | |
|  |  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  |  | 2 |  | | | |
|  |  | 3 |  | | | |
|  | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
|  | dB | 1 | 4 | 4 | -Infinity | 4 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
|  |  | 2 | -94 | -94 | -Infinity | -94 |
|  |  | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | --64.60 | -62.25 |
|  | dBm/9.36 MHz | 2 | -64.60 | -62.25 | --64.60 | -62.25 |
|  | dBm/38.16 MHz | 3 | -58.50 | -56.16 | --58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.1.3.3 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.

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.6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX

##### A.6.6.1.4.1 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 9.2.6.2 and 9.2.6.3.

##### A.6.6.1.4.2 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 parameters for PCell are given in Table A.6.6.1.4.2-1, A.6.6.1.4.2-2 and A.6.6.1.4.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

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

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

**Table A.6.6.1.4.2-1: 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.6.6.1.4.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
|  |  |  | **Test 1** | **Test 2** |  |
| Active cell |  | 1, 2, 3 | Cell 1 | |  |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 | |  |
| Measurement gap type |  | 1, 2, 3 | Per-UE gaps | |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3 | 40 | |  |
| Measurement gap length | ms | 1, 2, 3 | 6 | |  |
| Measurement gap offset | ms | 1, 2, 3 | 39 | |  |
| 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 | |  |
| CSI-RS parameters |  | 1 | CSI-RS.1.2 FDD resource #0 | |  |
|  |  | 2 | CSI-RS.1.2 TDD resource #0 | |  |
|  |  | 3 | CSI-RS.2.2 TDD resource #0 | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |  |
| CP length |  | 1, 2, 3 | Normal | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3 | DRX.1 | DRX.7 |  |
|  |  |  |  | |  |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |  | 2 | 3 μs | | Synchronous cells |
|  |  | 3 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |  |
| T2 | s | 1, 2, 3 | 5 | 10 |  |

**Table A.6.6.1.4.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test** | **Cell 1** | | **Cell 2** | |
|  |  | **configuration** | **T1** | **T2** | **T1** | **T2** |
| TDD |  | 1 | TN/A | | TN/A | |
| configuration |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | N/A | |
| configuration |  | 2 | SR.1.1 TDD | |  | |
|  |  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | N/A | |
| RMC |  | 2 | CR.1.1 TDD | | N/A | |
| configuration |  | 3 | CR.2.1 TDD | | N/A | |
| Dedicated |  | 1 | CCR.1.2 FDD | | N/A | |
| CORESET RMC |  | 2 | CCR.1.2 TDD | | N/A | |
| configuration |  | 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS |  | 1 | TRS.1.1 FDD | | N/A | |
| configuration |  | 2 | TRS.1.1 TDD | | N/A | |
|  |  | 3 | TRS.1.2 TDD | | N/A | |
| IInitial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  |  | 2 | -98 | | | |
|  |  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  |  | 2 |  | | | |
|  |  | 3 |  | | | |
|  | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
|  | dB | 1 | 4 | 4 | -Infinity | 4 |
|  |  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
|  |  | 2 | -94 | -94 | -Infinity | -94 |
|  |  | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | --64.60 | -62.25 |
|  | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/38.16 MHz | 3 | -58.50 | -56.16 | --58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: Table A.6.6.1.4.2-1The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Table A.6.6.1.4.2-1Interference 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: Table A.6.6.1.4.2-1SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

**Table A.6.6.1.4.2-4: Void**

**Table A.6.6.1.4.2-5: Void**

##### A.6.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

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

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

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

#### A.6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading

##### A.6.6.1.5.1 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 9.2.5.1 and 9.2.5.2.

##### A.6.6.1.5.2 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 parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.5.2-1 and A.6.6.1.5.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The 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.

**Table A.6.6.1.5.2-1: Supported test configurations**

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

**Table A.6.6.1.5.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 |  |
| Neighbour cell |  | 1 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1 | 1: Cell 1 and Cell 2 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
| A3-Offset | dB | 1 | -4.5 |  |
| CP length |  | 1 | Normal |  |
| Hysteresis | dB | 1 | 0 |  |
| Time To Trigger | s | 1 | 0 |  |
| Filter coefficient |  | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 |  | OFF |
|  |  |  |  |  |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 5 |  |

**Table A.6.6.1.5.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | N/A | |
| IInitial BWP configuration |  | 1 | DLBWP.0,1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | --64.60 | -62.25 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.1.5.3 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 required to read the neighbour cell SSB index and report the acquired SSB index in this test.

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

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

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

#### A.6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading

##### A.6.6.1.6.1 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 9.2.6.2 and 9.2.6.3.

##### A.6.6.1.6.2 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 parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.6.2-1 and A.6.6.1.6.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The 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.

**Table A.6.6.1.6.2-1: Supported test configurations**

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

**Table A.6.6.1.6.2-2: General test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 |  |
| Neighbour cell |  | 1 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1 | 1: Cell 1 and Cell 2 |  |
| Measurement gap type |  | 1 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1 | 40 |  |
| Measurement gap length | ms | 1 | 6 |  |
| Measurement gap offset | ms | 1 | 39 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
| CSI-RS parameters |  | 1 | CSI-RS.1.2 FDD resource #0 |  |
| A3-Offset | dB | 1 | -4.5 |  |
| CP length |  | 1 | Normal |  |
| Hysteresis | dB | 1 | 0 |  |
| Time To Trigger | s | 1 | 0 |  |
| Filter coefficient |  | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 |  | OFF |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 5 |  |

**Table A.6.6.1.6.2-3: 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** |
| TDD configuration |  | 1 | N/A | | N/A | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| TRS configuration |  | 1 | TRS.1.1 FDD | | N/A | |
| IInitial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration |  | 1 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | --64.60 | -62.25 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.1.6.3 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 required to read the neighbour cell SSB index and report the acquired SSB index in this test.

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

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

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

A.6.6.2 Inter-frequency Measurements

#### A.6.6.2.1 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

##### A.6.6.2.1.1 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 9.3.4.

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 parameters are given in Tables A.6.6.2.1.1-1, A.6.6.2.1.1-2 and A.6.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 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.

**Table A.6.6.2.1.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1**

|  |  |
| --- | --- |
| **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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table A.6.6.2.1.1-2: 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 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 9 | 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 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 1 | 1 |  |

**Table A.6.6.2.1.1-3: 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** |
| NR 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 | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | |
| Config 3 | 40: NRB,c = 106 | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | |
| Config 3 | 40: NRB,c = 106 | | | | |
| BWP configuration | Initial DL BWP |  | Config 1, 2, 3 | DLBWP.0.1 | | | NA | |
| Initial UL BWP |  | ULBWP.0.1 | | | NA | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | NA | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | NA | |
| TRS configuration | |  | Config 1 | TRS.1.1 FDD | | | NA | |
| Config 2 | TRS.1.1 TDD | | | NA | |
| Config 3 | TRS.1.2 TDD | | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | | - | |
|  | Config 2 | SR.1.1 TDD | | |
|  | Config 3 | SR.2.1 TDD | | |
| 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 parameters | |  | Config 1 | SSB.1 FR1 | | | SSB.5 FR1 | |
|  | Config 2 | SSB.1 FR1 | | | SSB.5 FR1 | |
|  | Config 3 | SSB.2 FR1 | | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | |  | Config 1 | SMTC.2 | | | SMTC.5 | |
|  | Config 2, 3 | SMTC.1 | | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | |
| Config 3 | 30 | | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz |  | -98 | | -98 | | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | | |
| Config 3 | -95 | | -95 | | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | | -Infinity | -91 |
| Config 3 | -91 | -91 | | -Infinity | -88 |
|  | | dB | Config 1,2,3,4,5,6 | 4 | 4 | | -Infinity | 7 |
|  | | dB | Config 1,2,3 | 4 | 4 | | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3 | -58.49 | -58.49 | | -63.94 | -56.15 |
| Propagation Condition | |  | Config 1,2,3 | AWGN | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | |

##### A.6.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

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

#### A.6.6.2.2 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is used

##### A.6.6.2.2.1 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 9.3.4.

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 parameters are given in Tables A.6.6.2.2.1-1, A.6.6.2.2.1-2 and A.6.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

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.

**Table A.6.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1**

|  |  |
| --- | --- |
| **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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table A.6.6.2.2.1-2: 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** | **Test 3** | **Test 4** |
| 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 | | 4 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | | 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 | 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 | 1.1 | 11 |  |

**Table A.6.6.2.2.1-3: 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** | |
| NR 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 | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | |
| BWP configuration | Initial DL BWP |  | Config 1, 2, 3 | DLBWP.0.1 | | | | NA | | |
| Initial UL BWP |  | Config 1, 2, 3 | ULBWP.0.1 | | | | NA | | |
| Dedicated DL BWP |  |  | DLBWP.1.1 | | | | NA | | |
| Dedicated UL BWP |  |  | ULBWP.1.1 | | | | NA | | |
| TRS configuration | |  | Config 1 | TRS.1.1 FDD | | | | NA | | |
| Config 2 | TRS.1.1 TDD | | | | NA | | |
| Config 3 | TRS.1.2 TDD | | | | NA | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | | | - | | |
|  | Config 2 | SR.1.1 TDD | | | |
|  | Config 3 | SR.2.1 TDD | | | |
| 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 parameters | |  | Config 1 | SSB.1 FR1 | | | | SSB.5 FR1 | | |
|  | Config 2 | SSB.1 FR1 | | | | SSB.5 FR1 | | |
|  | Config 3 | SSB.2 FR1 | | | | SSB.6 FR1 | | |
| SMTC configuration defined in A.3.11 | |  | Config 1 | SMTC.2 | | | | SMTC.5 | | |
|  | Config 2, 3 | SMTC.1 | | | | SMTC.4 | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | | |
| Config 3 | 30 | | | | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz | Config 1,2,3 | -98 | | -98 | | | | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | | | | |
| Config 3 | -95 | | -95 | | | | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | | | -Infinity | -91 | |
| Config 3 | -91 | -91 | | | -Infinity | -88 | |
|  | | dB | Config 1,2,3,4,5,6 | 4 | 4 | | | -Infinity | 7 | |
|  | | dB | Config 1,2,3 | 4 | 4 | | | -Infinity | 7 | |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | | | -70.05 | -62.2 | |
| dBm/38.16MHz | Config 3 | -58.49 | -58.49 | | | -63.94 | -56.15 | |
| Propagation Condition | |  | Config 1,2,3 | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | | |

**Table A.6.6.2.2.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | **Test1&3** | **Test2&4** | **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 |  |

**Table A.6.6.2.2.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

##### A.6.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

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

#### A.6.6.2.3 Void

#### A.6.6.2.4 Void

#### A.6.6.2.5 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

##### A.6.6.2.5.1 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 9.3.4.

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 parameters are given in Tables A.6.6.2.5.1-1, A.6.6.2.5.1-2 and A.6.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.5.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 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.

**Table A.6.6.2.5.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1**

|  |  |
| --- | --- |
| **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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table A.6.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with 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 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 9 | 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 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 1.1 | 1 |  |

Table A.6.6.2.5.1-3: 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 |
| NR 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 | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| Config 3 | 40: NRB,c = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| Config 3 | 40: NRB,c = 106 | | | |
| BWP configuration | Initial DL BWP |  | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | ULBWP.1.1 | | NA | |
| TRS configuration | |  | Config 1 | TRS.1.1 FDD | | NA | |
| Config 2 | TRS.1.1 TDD | | NA | |
| Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR.2.1 TDD | |
| 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 parameters | |  | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | |  | Config 1 | SMTC.2 | | SMTC.5 | |
|  | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz |  | -98 | | -98 | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| Config 3 | -91 | -91 | -Infinity | -88 |
|  | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
|  | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| dBm/38.16MHz | Config 3 | -58.4 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | |  | Config 1,2,3 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

##### A.6.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

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

#### A.6.6.2.6 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is used

##### A.6.6.2.6.1 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 9.3.4.

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 parameters are given in Tables A.6.6.2.6.1-1, A.6.6.2.6.1-2 and A.6.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.6.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.6.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

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.

**Table A.6.6.2.6.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1**

|  |  |
| --- | --- |
| **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: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table A.6.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | | | Two 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 | | 4 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | | 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 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | Config 1 | 3 ms | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3 μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | | |  |
| T2 | s | Config 1,2,3 | 1.3 | 13.5 | 1.3 | 13.5 |  |

**Table A.6.6.2.6.1-3: 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** |
| NR 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 | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| Config 3 | 40: NRB,c = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| Config 3 | 40: NRB,c = 106 | | | |
| BWP configuration | Initial DL BWP |  | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | ULBWP.1.1 | | NA | |
| TRS configuration | |  | Config 1 | TRS.1.1 FDD | | NA | |
| Config 2 | TRS.1.1 TDD | | NA | |
| Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR2.1 TDD | |
| RMSI CORESET Reference Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | Config 2 | CR.1.1 TDD | |
|  | Config 3 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | |  | Config 1 | CCR.1.1 FDD | | - | |
|  | |  | Config 2 | CCR.1.1 TDD | |  | |
|  | |  | Config 3 | CCR.2.1 TDD | |  | |
| SSB parameters | |  | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | |  | Config 1 | SMTC.2 | | SMTC.5 | |
|  | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz |  | -98 | | -98 | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| Config 3 | -91 | -91 | -Infinity | -88 |
|  | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
|  | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | |  | Config 1,2,3 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

##### A.6.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

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

#### A.6.6.2.7 Void

#### A.6.6.2.8 Void

### A.6.6.3 Inter-RAT Measurements

#### A.6.6.3.1 SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1

##### A.6.6.3.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

Supported test configurations are shown in table A.6.6.3.1.1-1. General test parameters are provided in Table A.6.6.3.1.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.1.1-3 and A.6.6.3.1.1-4, respectively.

**Table A.6.6.3.1.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

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

**Table A.6.6.3.1.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| NR RF Channel Number |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number |  | 1 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables A.6.6.3.1.1-2 and A.6.6.3.1.1-3. |  |
| Active cell |  | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell |  | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id |  | 0 | As specified in Clause Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity |  | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity |  | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| b2-Threshold2EUTRA | dBm | -97 | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis | dB | 0 |  |
| TimeToTrigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | OFF |
| T1 | s | 5 |  |
| T2 | s | 5 |  |
| Note 1: Values are defined in Table A.6.6.3.1.1-3 | | | |

**Table A.6.6.3.1.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Configuration** | **Cell 1** | |
|  | **T1** | **T2** |
| RF channel number | | |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD Configuration | | SCS=15 KHz |  | 2, 5 | TDDConf.1.1 | |
| SCS=30 KHz |  | 3, 6 | TDDConf.2.1 | |
| BWchannel | | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | |
| 2, 5 | 10: NRB,c = 52 (TDD) | |
| 3, 6 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | | |  | 1, 4 | SR.1.1 FDD | |
| 2, 5 | SR.1.1 TDD | |
| 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | |  | 1, 4 | CR.1.1 FDD | |
| 2, 5 | CR.1.1 TDD | |
| 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | |  | 1, 4 | CCR.1.1 FDD | |
|  | | |  | 2, 5 | CCR.1.1 TDD | |
|  | | |  | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Dedicated DL BWP | |  | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| Initial UL BWP | |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| Dedicated UL BWP | |  | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG patternNote1 | | |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | |  | 1, 2, 4, 5 | SSB.1 FR1 | |
| 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | |  | 1, 4 | TRS.1.1 FDD | |
|  | | |  | 2, 5 | TRS.1.1 TDD | |
|  | | |  | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | | dBm | 1, 2, 4, 5 | -96 | |
| 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH\_DMRS | | |
| EPRE ratio of PDCCH\_DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | |
| EPRE ratio of PDSCH\_DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | |
| EPRE ratio of OCNG DMRS to SSS | | |
| EPRE ratio of OCNG to OCNG DMRS | | |
| *Noc*Note2 | | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -104 | |
| *Noc*Note2 | | | dBm/SCS | 1, 2, 4, 5 | -104 | |
| 3, 6 | -101 | |
| Ês/Noc | | | dB | 1, 2, 3, 4, 5, 6 | 16 | 0 |
| Ês/IotNote3 | | | dB | 1, 2, 3, 4, 5, 6 | 16 | 0 |
| SS-RSRPNote3 | | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 |
|  | | | 3, 6 | -85 | -101 |
| SSB\_RPNote3 | | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 |
|  | | | 3, 6 | -85 | -101 |
| IoNote3 | | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.94 | -73.04 |
| dBm/38.16 MHz | 3, 6 | -53.84 | -66.93 |
| Propagation condition | | |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | |  | 1, 2, 3, 4, 5, 6 | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table A.6.6.3.1.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | |
| **T1** | **T2** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
| NocNote4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -106 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 19 |
| Ês/IotNote5 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 19 |
| RSRPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87 |
| SCH\_RPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87 |
| IoNote5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21+10log (NRB,c /50) | -56.12+10log (NRB,c /50) |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.6.6.3.1.2 Test Requirements

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

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

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

#### A.6.6.3.2 SA NR - E-UTRAN event-triggered reporting in DRX in FR1

##### A.6.6.3.2.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3. There are two test cases. In test 1 the UE shall be configured with DRX cycle of 40 ms. In test 2 the UE shall be configured with DRX cycle of 640 ms.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore the UE shall be allocated with PUSCH resource at every DRX cycle

Supported test configurations are shown in table A.6.6.3.2.1-1. General test parameters are provided in Table A.6.6.3.2.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.2.1-3 and A.6.6.3.2.1-4, respectively.

**Table A.6.6.3.2.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

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

**Table A.6.6.3.2.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** | **Comment** |
| **Value** | |
| NR RF Channel Number |  | 1 | | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number |  | 2 | | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables A.6.6.3.2.1-2 and A.6.6.3.2.1-3. | |  |
| Active cell |  | Cell 1 | | Cell 1 is on RF channel number 1 |
| Neighbour cell |  | Cell 2 | | Cell 2 is on RF channel number 2 |
| Gap Pattern Id |  | 0 | | As specified in Clause Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity |  | SS-RSRP | | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity |  | RSRP | | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| b2-Threshold2EUTRA | dBm | -97 | | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis | dB | 0 | |  |
| TimeToTrigger | s | 0 | |  |
| Filter coefficient |  | 0 | | L3 filtering is not used |
| DRX |  | DRX.1 | DRX.7 | DRX cycle configurations DRX.1 and DRX.7 are defined in Table A.3.3.1-1 and Table A.3.3.7-1 respectively. |
| T1 | s | 5 | |  |
| T2 | s | 5 | 15 |  |
| Note 1: Values are defined in Table A.6.6.3.2.1-3 | | | | |

Table A.6.6.3.2.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Configuration** | **Cell 1** | |
|  | **T1** | **T2** |
| RF channel number | | |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD Configuration | | SCS=15 KHz |  | 2, 5 | TDDConf.1.1 | |
| SCS=30 KHz |  | 3, 6 | TDDConf.2.1 | |
| BWchannel | | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | |
| 2, 5 | 10: NRB,c = 52 (TDD) | |
| 3, 6 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | | |  | 1, 4 | SR.1.1 FDD | |
| 2, 5 | SR.1.1 TDD | |
| 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | |  | 1, 4 | CR.1.1 FDD | |
| 2, 5 | CR.1.1 TDD | |
| 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | |  | 1, 4 | CCR.1.1 FDD | |
|  | | |  | 2, 5 | CCR.1.1 TDD | |
|  | | |  | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Dedicated DL BWP | |  | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| Initial UL BWP | |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| Dedicated UL BWP | |  | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG patternNote1 | | |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | |  | 1, 2, 4, 5 | SSB.1 FR1 | |
| 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | |  | 1, 4 | TRS.1.1 FDD | |
|  | | |  | 2, 5 | TRS.1.1 TDD | |
|  | | |  | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | | dBm | 1, 2, 4, 5 | -96 | |
| 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH\_DMRS | | |
| EPRE ratio of PDCCH\_DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | |
| EPRE ratio of PDSCH\_DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | |
| EPRE ratio of OCNG DMRS to SSS | | |
| EPRE ratio of OCNG to OCNG DMRS | | |
| *Noc*Note2 | | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -104 | |
| *Noc*Note2 | | | dBm/SCS | 1, 2, 4, 5 | -104 | |
| 3, 6 | -101 | |
| Ês/Noc | | | dB | 1, 2, 3, 4, 5, 6 | 16 | 0 |
| Ês/IotNote3 | | | dB | 1, 2, 3, 4, 5, 6 | 16 | 0 |
| SS-RSRPNote3 | | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 |
|  | | | 3, 6 | -85 | -101 |
| SSB\_RPNote3 | | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 |
|  | | | 3, 6 | -85 | -101 |
| IoNote3 | | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.94 | -73.04 |
| dBm/38.16 MHz | 3, 6 | -53.84 | -66.93 |
| Propagation condition | | |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | |  | 1, 2, 3, 4, 5, 6 | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table A.6.6.3.2.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | |
| **T1** | **T2** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
| NocNote4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17 |
| Ês/IotNote5 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17 |
| RSRPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87 |
| SCH\_RPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87 |
| IoNote5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21+10log (NRB,c /50) | -56.12+10log (NRB,c /50) |
| Propagation Condition Note6 |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 |  | 1, 2, 3, 4, 5, 6 | 1x2 | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

##### A.6.6.3.2.2 Test Requirements

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

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

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

### A.6.6.4 L1-RSRP measurement for beam reporting

#### A.6.6.4.1 SSB based L1-RSRP measurement when DRX is not used

##### A.6.6.4.1.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.1.1-1.

Table A.6.6.4.1.1-1: 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 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 | |

##### A.6.6.4.1.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.1.2-1 and Table A.6.6.4.1.2-2 below.

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.6.6.4.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
| 2 | TDD |
| 3 | TDD |
| TDD Configuration | 1 |  | N/A |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
| 2 | SSB.3 FR1 |
| 3 | SSB.4 FR1 |
| OCNG Patterns | 1~3 |  | OP.1 |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
| 2 |  | TRS.1.1 TDD |
| 3 |  | TRS.1.2 TDD |
| DRX configuration | 1~3 |  | Off |
| reportConfigType | 1~3 |  | periodic |
| reportQuantity | 1~3 |  | ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 1 |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.6.6.4.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| 3 | -91.65 | | | |
|  | 1~3 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.65 |
| 3 | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| 3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1~3 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

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

#### A.6.6.4.2 SSB based L1-RSRP measurement when DRX is used

##### A.6.6.4.2.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.2.1-1.

Table A.6.6.4.2.1-1: 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 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 | |

##### A.6.6.4.2.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.2.2-1 and Table A.6.6.4.2.2-2 below.

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.6.6.4.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
| 2 | TDD |
| 3 | TDD |
| TDD Configuration | 1 |  | N/A |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
| 2 | SSB.3 FR1 |
| 3 | SSB.4 FR1 |
| OCNG Patterns | 1~3 |  | OP.1 |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
| 2 |  | TRS.1.1 TDD |
| 3 |  | TRS.1.2 TDD |
| DRX configuration | 1~3 |  | DRX.3 |
| reportConfigType | 1~3 |  | periodic |
| reportQuantity | 1~3 |  | ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 1 |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.6.6.4.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| 3 | -91.65 | | | |
|  | 1~3 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.65 |
| 3 | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| 3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1~3 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

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

#### A.6.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.6.6.4.3.1 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 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.3.1-1.

Table A.6.6.4.3.1-1: Applicable NR configurations for FR1 CSI-RS 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 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 | |

##### A.6.6.4.3.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.3.2-1 and Table A.6.6.4.3.2-2 below.

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.6.6.4.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
| 2 | TDD |
| 3 | TDD |
| TDD Configuration | 1 |  | N/A |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
| 2 | SSB.3 FR1 |
| 3 | SSB.4 FR1 |
| CSI-RS configuration | 1 |  | CSI-RS 1.3 FDD |
| 2 | CSI-RS 1.3 TDD |
| 3 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 |  | OP.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
| 2 |  | TRS.1.1 TDD |
| 3 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| DRX configuration | 1~3 |  | Off |
| reportConfigType | 1~3 |  | aperiodic |
| reportQuantity | 1~3 |  | cri-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| qcl-Info | 1~3 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 8 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.6.6.4.3.2-2: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~3 | dBm/15kHz | -94.65 | |
| Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| 3 | -91.65 | |
|  | 1~3 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.65 |
| 3 | -91.65 | -88.65 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~3 | dB | 0 | 3 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.6.6.4.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

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

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

#### A.6.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.6.6.4.4.1 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 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.4.1-1.

Table A.6.6.4.4.1-1: Applicable NR configurations for FR1 CSI-RS 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 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 | |

##### A.6.6.4.4.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.4.2-1 and Table A.6.6.4.4.2-2 below.

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.6.6.4.4.2-1.

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.6.6.4.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
| 2 | TDD |
| 3 | TDD |
| TDD Configuration | 1 |  | N/A |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
| 2 | SSB.3 FR1 |
| 3 | SSB.4 FR1 |
| CSI-RS configuration | 1 |  | CSI-RS 1.3 FDD |
| 2 | CSI-RS 1.3 TDD |
| 3 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 |  | OP.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
| 2 |  | TRS.1.1 TDD |
| 3 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| DRX configuration | 1~3 |  | DRX.3 |
| reportConfigType | 1~3 |  | aperiodic |
| reportQuantity | 1~3 |  | cri-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| qcl-Info | 1~3 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 8 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.6.6.4.4.2-2: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~3 | dBm/15kHz | -94.65 | |
| Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| 3 | -91.65 | |
|  | 1~3 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.65 |
| 3 | -91.65 | -88.65 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~3 | dB | 0 | 3 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.6.6.4.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

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

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

## A.6.7 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.6.7.1 SS-RSRP

#### A.6.7.1.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.1.1.1 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.6.7.1.1.2 Test parameters

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

**Table A.6.7.1.1.2-1: 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.6.7.1.1.2-2: SS-RSRP Intra frequency test parameters**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | | | **Unit** | **Test 1** | | | **Test 2** | | | | | | **Test 3** | | | | | |
| **Cell 1** | **Cell 2** | | **Cell 1** | | **Cell 2** | | | | **Cell 1** | | | **Cell 2** | | |
| Cell ID | | | | | |  | 489 | 0 | | 489 | | 0 | | | | 489 | | 0 | | | |
| SSB ARFCN | | | | | |  | freq1 | | | freq1 | | | | | | freq1 | | | | | |
| Duplex mode | | | | Config 1 | |  | FDD | | | | | | | | | | | | | | |
| Config 2,3 | | TDD | | | | | | | | | | | | | | |
| TDD configuration | | | | Config 1 | |  | Not Applicable | | | | | | | | | | | | | | |
| Config 2 | | TDDConf.1.1 | | | | | | | | | | | | | | |
| Config 3 | | TDDConf.2.1 | | | | | | | | | | | | | | |
| BWchannel | | | | Config 1 | | MHz | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 2 | | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 3 | | 40: NRB,c = 106 | | | | | | | | | | | | | | |
| BWP BW | | | | Config 1 | |  | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 2 | | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 3 | | 40: NRB,c = 106 | | | | | | | | | | | | | | |
| Downlink initial BWP configuration | | | | | |  | DLBWP.0.1 | | | | | | | | | | | | | | |
| Downlink dedicated BWP configuration | | | | | |  | DLBWP.1.1 | | | | | | | | | | | | | | |
| Uplink initial BWP configuration | | | | | |  | ULBWP.0.1 | | | | | | | | | | | | | | |
| Uplink dedicated BWP configuration | | | | | |  | ULBWP.1.1 | | | | | | | | | | | | | | |
| TRS configuration | | | | | Config 1 |  | TRS.1.1 FDD | | NA | | TRS.1.1 FDD | | | NA | TRS.1.1 FDD | | | | | | NA |
| Config 2 |  | TRS.1.1 TDD | | NA | | TRS.1.1 TDD | | | NA | TRS.1.1 TDD | | | | | | NA |
| Config 3 |  | TRS.1.2 TDD | | NA | | TRS.1.2 TDD | | | NA | TRS.1.2 TDD | | | | | | NA |
| DRX Cycle | | | | | | ms | Not Applicable | | | | | | | | | | | | | | |
| PDSCH Reference measurement channel | | | | Config 1 | |  | SR.1.1 FDD | | - | SR.1.1 FDD | | - | | | | SR.1.1 FDD | | | | | - |
| Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | | | | |
| Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | | | | |
| RMSI CORESET Reference Channel | | | | Config 1 | |  | CR.1.1 FDD | | - | CR.1.1 FDD | | - | | | | CR.1.1 FDD | | | | | - |
| Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | | | | |
| Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | | | | |
| Control channel RMC | | | | Config 1 | |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | | - | | | | CCR.1.1 FDD | | | | | - |
| Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | | | | |
| Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | | | | |
|  | | | |  | |  |  | |  |  | |  | | | |  | | | | |  |
|  | |  | |  | |  | | | | |
|  | |  | |  | |  | | | | |
| SSB configuration | | Config 1 | | | |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | | SSB.1 FR1 | | | | SSB.1 FR1 | | | | SSB.1 FR1 | |
| Config 2 | | | |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | | SSB.1 FR1 | | | | SSB.1 FR1 | | | | SSB.1 FR1 | |
| Config 3 | | | |  | SSB.2 FR1 | | SSB.2 FR1 | SSB.2 FR1 | | SSB.2 FR1 | | | | SSB.2 FR1 | | | | SSB.2 FR1 | |
| Time offset with Cell 1 | | Config 1 | | | | ms | - | | 3 | - | | 3 | | | | - | | | | 3 | |
| Config 2,3 | | | | μs | - | | 3 | - | | 3 | | | | - | | | | 3 | |
| SMTC configuration | | Config 1 | | | |  | SMTC.2 | | | | | | | | | | | | | | |
| Config 2,3 | | | |  | SMTC.1 | | | | | | | | | | | | | | |
| OCNG Patterns | | | | | |  | OCNG pattern 1 | | | | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1,2 | | kHz | 15 kHz | | | | | | | | | | | | | | |
| Config 3 | | 30kHz | | | | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | | | dB | 0 | | 0 | 0 | | | 0 | | | | 0 | | | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| Note2 | Config 1,2 | | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/15KhZ | -106 | | | -88 | | | | | | | -114 | | | | |
| NR\_FDD\_FR1\_B | -113.5 | | | | |
| NR\_TDD\_FR1\_C | -113 | | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | | | |
| NR\_FDD\_FR1\_G | -111 | | | | |
| NR\_FDD\_FR1\_H | -110.5 | | | | |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | Not applicableNote 5 | | | -94 | | | | | | | -114 | | | | |
| NR\_FDD\_FR1\_B | | -113.5 | | | | |
| NR\_TDD\_FR1\_C | | -113 | | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -112.5 | | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | -112 | | | | |
| NR\_FDD\_FR1\_G | | -111 | | | | |
| NR\_FDD\_FR1\_H | | -110.5 | | | | |
| Note2 | Config 1,2 | | | | | dBm/SCS | -106 | | | -88 | | | | | | | Same as Noc/15kHz | | | | |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | Not applicableNote 5 | | | -91 | | | | | | | -111 | | | | |
| NR\_FDD\_FR1\_B | | -110.5 | | | | |
| NR\_TDD\_FR1\_C | | -110 | | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -109.5 | | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | -109 | | | | |
| NR\_FDD\_FR1\_G | | -108 | | | | |
| NR\_FDD\_FR1\_H | | -107.5 | | | | |
|  | | | | | | dB | 2.46 | | -5.97 | 2.46 | | | -5.97 | | | | -0.01 | | | | -4.76 |
|  | | | | | | dB | 6 | | 1 | 6 | | | 1 | | | | 3 | | | | 0 |
| SS-RSRPNote3 | Config 1,2 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | | dBm/SCS | -100 | | -105 | -82 | | | -87 | | | | -111.00 | | | | -114.00 |
| NR\_FDD\_FR1\_B | | | -110.50 | | | | -113.50 |
| NR\_TDD\_FR1\_C | | | -110.00 | | | | -113.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | | -109.50 | | | | -112.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | | -109.00 | | | | -112.00 |
| NR\_FDD\_FR1\_G | | | -108.00 | | | | -111.00 |
| NR\_FDD\_FR1\_H | | | -107.50 | | | | -110.50 |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | Not applicableNote 5 | | Not applicableNote 5 | -85 | | | -90 | | | | -108.00 | | | | -111.00 |
| NR\_FDD\_FR1\_B | | -107.50 | | | | -110.50 |
| NR\_TDD\_FR1\_C | | -107.00 | | | | -110.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -106.50 | | | | -109.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | -106.00 | | | | -109.00 |
| NR\_FDD\_FR1\_G | | -105.00 | | | | -108.00 |
| NR\_FDD\_FR1\_H | | -104.50 | | | | -107.50 |
| IoNote3 | Config 1,2 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | dBm/  9.36MHz | -70.09 | | | -52.09 | | | | | | | -80.03 | | | | |
| NR\_FDD\_FR1\_B | | -79.53 | | | | |
| NR\_TDD\_FR1\_C | | -79.03 | | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -78.53 | | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | -78.03 | | | | |
| NR\_FDD\_FR1\_G | | -77.03 | | | | |
| NR\_FDD\_FR1\_H | | -76.53 | | | | |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | dBm/  38.16MHz | Not applicableNote 5- | | | -51.99 | | | | | | | -73.94 | | | | |
| NR\_FDD\_FR1\_B | | -73.44 | | | | |
| NR\_TDD\_FR1\_C | | -72.94 | | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -72.44 | | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | -71.94 | | | | |
| NR\_FDD\_FR1\_G | | -70.94 | | | | |
| NR\_FDD\_FR1\_H | | -70.44 | | | | |
| Propagation condition | | | | | | - | AWGN | | | | | | | | | | | | | | |
| Antenna configuration | | | | | |  | 1x2 | | | | | | | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | | | | | | | | | | | |

##### A.6.7.1.1.3 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.6.7.1.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.1.2.1 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.6.7.1.2.1-1.

**Table A.6.7.1.2.1-1: 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 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.6.7.1.2.2 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.6.7.1.2.2-1 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. The inter-frequency measurements are supported by a measurement gap.

Table A.6.7.1.2.2-1: SS-RSRP inter-frequency test parameters

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 | | | | Test 2 | | |
| Cell 1 | | | Cell 2 | Cell 1 | | Cell 2 |
| SSB ARFCN | | 1~3 |  | freq1 | | | freq2 | freq1 | | freq2 |
| BWchannel | | 1 | MHz | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | |
| 2 | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | |
| 3 | 40: NRB,c = 106 | | | | 40: NRB,c = 106 | | |
| Duplex mode | | 1 |  | FDD | | | | FDD | | |
| 2 | TDD | | | | TDD | | |
| 3 | TDD | | | | TDD | | |
| TDD configuration | | 1 |  | N/A | | | | N/A | | |
| 2 | TDDConf.1.1 | | | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | | | TDDConf.2.1 | | |
| PDSCH Reference measurement channel | | 1 |  | SR.1.1 FDD | | | - | SR.1.1 FDD | | - |
| 2 | SR.1.1 TDD | | | SR.1.1 TDD | |
| 3 | SR.2.1 FDD | | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | | 1 |  | CR.1.1 FDD | | | - | CR.1.1 FDD | | - |
| 2 | CR.1.1 TDD | | | - | CR.1.1 TDD | | - |
| 3 | CR.2.1 FDD | | | - | CR.2.1 FDD | | - |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.1.1 FDD | | | - | CCR.1.1 FDD | | - |
| 2 |  | CCR.1.1 TDD | | | - | CCR.1.1 TDD | | - |
| 3 |  | CCR.2.1 TDD | | | - | CCR.2.1 TDD | | - |
| SSB configuration | | 1 |  | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| 2 | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| 3 | SSB.2 FR1 | | | | SSB.2 FR1 | | |
| OCNG Patterns | | 1~3 |  | OP.1 | | | | OP.1 | | |
| TRS configuration | | 1 |  | TRS.1.1 FDD | | - | | TRS.1.1 FDD | |  |
| 2 |  | TRS.1.1 TDD | | TRS.1.1 TDD | |
| 3 |  | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP configuration | | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | | | DLBWP.1.1  ULBWP.1.1 | | |
| Time offset with Cell 1 | | 1 | ms | - | 3 | | | - | 3 | |
| 2,3 | μs | - | 3 | | | - | 3 | |
| SMTC configuration | | 1 |  | SMTC.2 | | | | SMTC.2 | | |
| 2,3 |  | SMTC.1 | | | | SMTC.1 | | |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | | | 0 | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~3 | dBm/15kHz | -94.65 | | | | ( for Channel 2 +8dB) | | -115 |
| NR\_FDD\_FR1\_B | -114.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 |
| NR\_FDD\_FR1\_G | -112 |
| NR\_FDD\_FR1\_H | -111.5 |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 1,2 | dBm/SSB SCS | -94.65 | | | | ( for Channel 2 +8dB) | | -115 |
| NR\_FDD\_FR1\_B | -114.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 |
| NR\_FDD\_FR1\_G | -112 |
| NR\_FDD\_FR1\_H | -111.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 3 | -91.65 | | | | ( for Channel 2 +8dB) | | -112.00 |
| NR\_FDD\_FR1\_B | -111.50 |
| NR\_TDD\_FR1\_C | -111.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -110.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -110.00 |
| NR\_FDD\_FR1\_G | -109.00 |
| NR\_FDD\_FR1\_H | -108.50 |
|  | | 1~3 | dB | 10 | | | 10 | 13 | | -3 |
| SS-RSRPNote3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 1,2,4,5 | dBm/SCS | -84.65 | | | | (RSRP for Cell 2 +25dB) | | -118.00 |
| NR\_FDD\_FR1\_B | -117.50 |
| NR\_TDD\_FR1\_C | -117.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116.00 |
| NR\_FDD\_FR1\_G | -115.00 |
| NR\_FDD\_FR1\_H | -114.50 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 3 | -81.65 | | | | (RSRP for Cell 2 +25dB) | | -115.00 |
| NR\_FDD\_FR1\_B | -114.50 |
| NR\_TDD\_FR1\_C | -114.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113.00 |
| NR\_FDD\_FR1\_G | -112.00 |
| NR\_FDD\_FR1\_H | -111.50 |
| IoNote3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 1,2 | dBm/  9.36MHz | -56.28 | | | | (Io for Channel 2 +19.75dB) | | -85.28 |
| NR\_FDD\_FR1\_B | -84.78 |
| NR\_TDD\_FR1\_C | -84.28 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -83.78 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -83.28 |
| NR\_FDD\_FR1\_G | -82.28 |
| NR\_FDD\_FR1\_H | -81.78 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 3 | dBm/  38.16MHz | -50.19 | | | | (Io for Channel 2 +19.75dB) | | -79.19 |
| NR\_FDD\_FR1\_B | -78.69 |
| NR\_TDD\_FR1\_C | -78.19 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -77.69 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -77.19 |
| NR\_FDD\_FR1\_G | -76.19 |
| NR\_FDD\_FR1\_H | -75.69 |
|  | | 1~3 | dB | 10 | | | 10 | 13 | | -3 |
| Propagation condition | | 1~3 | - | AWGN | | | | AWGN | | |
| Antenna configuration | | 1~3 |  | 1x2 | | | | 1x2 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | |

##### A.6.7.1.2.3 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.6.7.1.3 Void

### A.6.7.2 SS-RSRQ

#### A.6.7.2.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.2.1.1 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.6.7.2.1.2 Test Parameters

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

**Table A.6.7.2.1.2-1: 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.6.7.2.1.2-2: SS-RSRQ Intra frequency test parameters**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | | **Unit** | **Test 1** | | | | | **Test 2** | | | | **Test 3** | | |
| **Cell 1** | | | **Cell 2** | | **Cell 1** | | **Cell 2** | | **Cell 1** | | **Cell 2** |
| SSB ARFCN | | | | |  | freq1 | | | | | freq1 | | | | freq1 | | |
| Duplex mode | | | | Config 1 |  | FDD | | | | | | | | | | | |
| Config 2,3 | TDD | | | | | | | | | | | |
| TDD configuration | | | | Config 1 |  | Not Applicable | | | | | | | | | | | |
| Config 2 | TDDConf.1.1 | | | | | | | | | | | |
| Config 3 | TDDConf.2.1 | | | | | | | | | | | |
| BWchannel | | | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | | |
| Config 2 | 10: NRB,c = 52 | | | | | | | | | | | |
| Config 3 | 40: NRB,c = 106 | | | | | | | | | | | |
| Gap Pattern ID | | | |  |  | 0 | | | | | | | | | | | |
| BWP configuration | | | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | | | |
| Dedicated DL BWP | DLBWP.1.1 | | | | | | | | | | | |
| Initial UL BWP | ULBWP.0.1 | | | | | | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | | | |
| DRX Cycle | | | | | ms | Not Applicable | | | | | | | | | | | |
| PDSCH Reference measurement channel | | | | Config 1 |  | SR.1.1 FDD | | - | | | SR.1.1 FDD | | - | | SR.1.1 FDD | | - |
| Config 2 | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| Config 3 | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | | | Config 1 |  | CR.1.1 FDD | | - | | | CR.1.1 FDD | | - | | CR.1.1 FDD | |  |
| Config 2 | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| Config 3 | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control Channel RMC | | | | Config 1 |  | CCR.1.1 FDD | | - | | | CCR.1.1 FDD | | - | | CCR.1.1 FDD | | - |
| Config 2 | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| Config 3 | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS Configuration | | | | Config 1 |  | TRS.1.1 FDD | | - | | | TRS.1.1 FDD | | - | | TRS.1.1 FDD | | - |
| Config 2 | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| Config 3 | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | |  | OP. 1 | | | | | | | | | | | |
| SS-RSSI-Measurement | | | | |  | Not Applicable | | | | | | | | | | | |
| Time offset with Cell 1 | | | | Config 1 | ms | - | 3 | | | - | | 3 | | - | | 3 | |
| Config 2,3 | μs | - | 3 | | | - | | 3 | | - | | 3 | |
| SMTC configuration | | | | Config 1 |  | SMTC.2 | | | | | | | | | | | |
| Config 2,3 |  | SMTC.1 | | | | | | | | | | | |
| SSB configuration | | | | Config 1,2 |  | SSB.1 FR1 | | | | | | | | | | | |
| Config 3 | SSB.2 FR1 | | | | | | | | | | | |
| CSI-RS for tracking | | | | Config 1 |  | TRS.1.1 FDD | | | | | | | | | | | |
|  | | | | Config 2 |  | TRS.1.1 TDD | | | | | | | | | | | |
|  | | | | Config 3 |  | TRS.1.2 TDD | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | | |
| Config 3 | 30kHz | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | | dB | 0 | | 0 | | | 0 | | 0 | | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Note2 | Config 1,2 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -85 | | | | | -101 | | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -91 | | | | | - | | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Note2 | Config 1,2 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -85 | | | | | -101 | | | | -114  -113.5  -113  -112.5  -112  -111  -110.5 | | |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -88 | | | | | - | | | | -111 | | |
| NR\_FDD\_FR1\_B | -110.5 | | |
| NR\_TDD\_FR1\_C | -110 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -109.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -109 | | |
| NR\_FDD\_FR1\_G | -108 | | |
| NR\_FDD\_FR1\_H | -107.5 | | |
|  | | | | | dB | -1.76 | | | | | -4.7 | | | | -5..46 | | -5.46 |
|  | | | | | dB | 3 | | 3 | | | -2.9 | | -2.9 | | -4 | | -4 |
| SS-RSRPNote3 | Config 1,2 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | dBm/SCS | -82 | | -82 | | | -103.9 | | -103.9 | | -118 | | -118 |
| NR\_FDD\_FR1\_B | | -117.5 | | -117.5 |
| NR\_TDD\_FR1\_C | | -117 | | -117 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -116.5 | | -116.5 |
| NR\_FDD\_FR1\_E,  NR\_TDD\_FR1\_E | | -116 | | -116 |
| NR\_FDD\_FR1\_G | | -115 | | -115 |
| NR\_FDD\_FR1\_H | | -114.5 | | -114.5 |
| Config 3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -85 | | -85 | | | - | | - | | -115 | | -115 |
| NR\_FDD\_FR1\_B | -114.5 | | -114.5 |
| NR\_TDD\_FR1\_C | -114 | | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | | -113.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | | -113 |
| NR\_FDD\_FR1\_G | -112 | | -112 |
| NR\_FDD\_FR1\_H | -111.5 | | -111.5 |
| SS-RSRQ Note3 | | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dB | -14.77 | | -14.77 | | | -16.76 | | -16.76 | | -17.34 | | -17.34 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | | Config 1,2 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -50 | | | | | -70 | | | | -83.5 | | |
| NR\_FDD\_FR1\_B | -83 | | |
| NR\_TDD\_FR1\_C | -82.5 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -82 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -81.5 | | |
| NR\_FDD\_FR1\_G | -80.5 | | |
| NR\_FDD\_FR1\_H | -80 | | |
| Config 3 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -50 | | | | | - | | | | -77.4 | | |
| NR\_FDD\_FR1\_B | -76.9 | | |
| NR\_TDD\_FR1\_C | -76.4 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -75.9 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -75.4 | | |
| NR\_FDD\_FR1\_G | -74.4 | | |
| NR\_FDD\_FR1\_H | -73.9 | | |
| Propagation condition | | | | | - | AWGN | | AWGN | | | AWGN | | AWGN | | AWGN | | AWGN |
| Antenna configuration | | | | |  | 1x2 | | 1x2 | | | 1x2 | | 1x2 | | 1x2 | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | | | | | | | |

##### A.6.7.2.1.3 Test Requirements

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

#### A.6.7.2.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.2.2.1 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.6.7.2.2.2 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.6.7.2.2.2-1. 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. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.6.7.2.2.2-1: 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 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 | |

**Table A.6.7.2.2.2-2: SS-RSRQ Inter frequency test parameters**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **Test 1** | | | | **Test 2** | | | | | | **Test 3** | | | | |
| **Cell 1** | | **Cell 2** | | **Cell 1** | | | **Cell 2** | | | **Cell 1** | | | **Cell 2** | |
| SSB ARFCN | | | |  | freq1 | freq2 | | | freq1 | | | | freq2 | | freq1 | | freq2 | | |
| Duplex mode | | Config 1 | |  | FDD | | | | | | | | | | | | | | |
| Config 2,3 | | TDD | | | | | | | | | | | | | | |
| TDD configuration | | Config 1 | |  | Not Applicable | | | | | | | | | | | | | | |
| Config 2 | | TDDConf.1.1 | | | | | | | | | | | | | | |
| Config 3 | | TDDConf.2.1 | | | | | | | | | | | | | | |
| BWchannel | | Config 1 | | MHz | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 2 | | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 3 | | 40: NRB,c = 106 | | | | | | | | | | | | | | |
| Gap pattern ID | | Config 1,2,3 | |  | 0 | | | | | | | | | | | | | | |
| BWP BW | | Config 1 | |  | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 2 | | 10: NRB,c = 52 | | | | | | | | | | | | | | |
| Config 3 | | 40: NRB,c = 106 | | | | | | | | | | | | | | |
| DRX Cycle | | | | ms | Not Applicable | | | | | | | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 | |  | SR.1.1 FDD | - | | | SR.1.1 FDD | | | - | | | SR.1.1 FDD | | | - | |
| Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD | | | SR.1.1 TDD | | |
| Config 3,6 | | SR2.1 TDD | SR2.1 TDD | | | SR2.1 TDD | | |
| RMSI CORESET Reference Channel | | Config 1 | |  | CR.1.1 FDD | - | | | R.1.1 FDD | | | - | | | CR.1.1 FDD | | |  | |
| Config 2 | |  | CR.1.1 TDD |  | | | CR.1.1 TDD | | |  | | | CR.1.1 TDD | | |  | |
| Config 3 | |  | CR2.1 TDD |  | | | CR2.1 TDD | | |  | | | CR2.1 TDD | | |  | |
| Dedicated CORESET Reference Channel | | Config 1 | |  | CCR.1.1 FDD | - | | | CCR.1.1 FDD | | | - | | | CCR.1.1 FDD | | | - | |
| Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| Config 3 | | CCR2.1 TDD | CCR2.1 TDD | | | CCR2.1 TDD | | |
| TRS Configuration | | Config 1 | |  | TRS.1.1 FDD | - | | | TRS.1.1 FDD | | | - | | | TRS.1.1 FDD | | | - | |
| Config 2 | | TRS.1.1 TDD | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| Config 3 | | TRS.1.2 TDD | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| OCNG Patterns | | | |  | OCNG pattern 1 | | | | | | | | | | | | | | |
| Time offset with Cell 1 | | Config 1 | | ms | - | | | 3 | | - | 3 | | | - | | 3 | | | |
| Config 2,3 | | μs | - | | | 3 | | - | 3 | | | - | | 3 | | | |
| SMTC configuration | | Config 1 | |  | SMTC pattern 2 | | | | | | | | | | | | | | |
| Config 2,3 | | SMTC pattern 1 | | | | | | | | | | | | | | |
| SSB configuration | | Config 1,2 | | SSB pattern 1 in FR1 | | | | | | | | | | | | | | |
| Config 3 | | SSB pattern 2 in FR1 | | | | | | | | | | | | | | |
| CSI-RS for tracking | | Config 1 | |  | TRS.1.1 FDD | | | | | | | | | | | | | | |
|  | | Config 2 | |  | TRS.1.1 TDD | | | | | | | | | | | | | | |
|  | | Config 3 | |  | TRS.1.2 TDD | | | | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | | kHz | 15 kHz | | | | | | | | | | | | | | |
| Config 3 | | 30 kHz | | | | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | | | 0 | | | 0 | | | 0 | | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -80.18 | | | | -106 | | | | | | -116 | | | | |
| NR\_FDD\_FR1\_B | -115.5 | | | | |
| NR\_TDD\_FR1\_C | -115 | | | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | | | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | | | | |
| NR\_FDD\_FR1\_G | -113 | | | | |
| NR\_FDD\_FR1\_H | -112.5 | | | | |
| Note2 | Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -86.27 | | | | -113 | | | | | | -116 | | | | |
| NR\_FDD\_FR1\_B | -115.5 | | | | |
| NR\_TDD\_FR1\_C | -115 | | | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | | | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | | | | |
| NR\_FDD\_FR1\_G | -113 | | | | |
| NR\_FDD\_FR1\_H | -112.5 | | | | |
| Note2 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -80.18 | | | | -106 | | | | | | -116 | | | | |
| NR\_FDD\_FR1\_B | -115.5 | | | | |
| NR\_TDD\_FR1\_C | -115 | | | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | | | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | | | | |
| NR\_FDD\_FR1\_G | -113 | | | | |
| NR\_FDD\_FR1\_H | -112.5 | | | | |
| Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -83.27 | | | | -110 | | | | | | -113 | | | | |
| NR\_FDD\_FR1\_B | -112.5 | | | | |
| NR\_TDD\_FR1\_C | -112 | | | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -111.5 | | | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -111 | | | | |
| NR\_FDD\_FR1\_G | -110 | | | | |
| NR\_FDD\_FR1\_H | -109.5 | | | | |
|  | | | | dB | -1.75 | | | | -1.75 | | | | | | 3 | | | -1.75 | |
|  | | | | dB | -1.75 | | | | -1.75 | | | | | | 3 | | | -1.75 | |
| SS-RSRPNote3 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -81.93 | -81.93 | | | -107.75 | | | -107.75 | | | -113 | | | | -117.75 |
| NR\_FDD\_FR1\_B | -112.5 | | | | -117.25 |
| NR\_TDD\_FR1\_C | -112 | | | | -116.75 |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -111.5 | | | | -116.25 |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -111 | | | | -115.75 |
| NR\_FDD\_FR1\_G | -110 | | | | -114.75 |
| NR\_FDD\_FR1\_H | -109.5 | | | | -114.25 |
| Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -85.02 | -85.02 | | | -111.75 | | | -111.75 | | | -110 | | | | -114.75 |
| NR\_FDD\_FR1\_B | -109.5 | | | | -114.25 |
| NR\_TDD\_FR1\_C | -109 | | | | -113.75 |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -108.5 | | | | -113.25 |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -108 | | | | -112.75 |
| NR\_FDD\_FR1\_G | -107 | | | | -111.75 |
| NR\_FDD\_FR1\_H | -106.5 | | | | -111.25 |
| SS-RSRQNote3 | | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dB | -14.77 | -14.77 | | | -40.59 | | | -40.59 | | | 12.56T | | | | 14.76T |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -50 | | | | -75.83 | | | | | | -83.28 | | | | -85.83 |
| NR\_FDD\_FR1\_B | -82.78 | | | | -85.33 |
| NR\_TDD\_FR1\_C | -82.28 | | | | -84.83 |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -81.78 | | | | -84.33 |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -81.28 | | | | -83.83 |
| NR\_FDD\_FR1\_G | -80.28 | | | | -82.83 |
| NR\_FDD\_FR1\_H | -79.78 | | | | -82.33 |
| Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -50 | | | | -76.73 | | | | | | -77.19 | | | | -79.73 |
| NR\_FDD\_FR1\_B | -76.69 | | | | -79.23 |
| NR\_TDD\_FR1\_C | -76.19 | | | | -78.73 |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -75.69 | | | | -78.23 |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -75.19 | | | | -77.73 |
| NR\_FDD\_FR1\_G | -74.19 | | | | -76.73 |
| NR\_FDD\_FR1\_H | -73.69 | | | | -76.53 |
| Propagation condition | | | | - | AWGN | AWGN | | | AWGN | | | AWGN | | | AWGN | | | AWGN | |
| Antenna configuration | | | |  | 1x2 | 1x2 | | | 1x2 | | | 1x2 | | | 1x2 | | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | | | | | | | | | |

##### A.6.7.2.2.3 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.6.7.3 SS-SINR

#### A.6.7.3.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.3.1.1 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.6.7.3.1.2 Test Parameters

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

**Table A.6.7.3.1.2-1: 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.6.7.3.1.2-2: SS-SINR Intra frequency test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | | | |  | freq1 | | freq1 | |
| 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 | | | |
| Downlink initial BWP configuration | | | |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | |  | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | |  | ULBWP.1.1 | | | |
| DRX Cycle configuration | | | | ms | Not Applicable | | | |
| TRS configuration | | | Config 1 |  | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
|  | | | Config 2 |  | TRS.1.1 TDD | TRS.1.1 TDD |
|  | | | Config 3 |  | TRS.1.2 TDD | TRS.1.2 TDD |
| PDSCH Reference measurement channel | | | Config 1 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
| Config 2 | SR.1.1 TDD | SR.1.1 TDD |
| Config 3 | SR.2.1 TDD | SR2.1 TDD |
| RMSI CORESET Reference Channel | | | Config 1 |  | CR.1.1 FDD | - | CR.1.1 FDD |  |
| Config 2 | CR.1.1 TDD | CR.1.1 TDD |
| Config 3 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| Config 2 | CCR.1.1 TDD | CCR.1.1 TDD |
| Config 3 | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | |  | OP.1 | | | |
| SS-RSSI-Measurement | | | |  | Not Applicable | | | |
| Time offset with Cell 1 | | | Config 1 | ms | - | 3 | - | 3 |
| Config 2,3 | μs | - | 3 | - | 3 |
| SMTC configuration | | | Config 1 |  | SMTC.2 | | | |
| Config 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 | | | |
| Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -93 | | -116 | |
| NR\_FDD\_FR1\_B | -115.5 | |
| NR\_TDD\_FR1\_C | -115 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -114.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -114 | |
| NR\_FDD\_FR1\_G | -113 | |
| NR\_FDD\_FR1\_H | -112.5 | |
| Note2 | Config 1,2 | | | dBm/SCS | -93 | | Same as Noc for 15 kHz | |
| Config 3 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -90 | | -113 | |
| NR\_FDD\_FR1\_B | -112.5 | |
| NR\_TDD\_FR1\_C | -112 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -111.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -111 | |
| NR\_FDD\_FR1\_G | -110 | |
| NR\_FDD\_FR1\_H | -109.5 | |
|  | | | | dB | 0 | -3.19 | -5.46 | -5.46 |
|  | | | | dB | 4.54 | 2.66 | -4 | -4 |
| SS-RSRPNote3 | Config 1,2 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -88.46 | -90.34 | -120 | -120 |
| NR\_FDD\_FR1\_B | -119.5 | -119.5 |
| NR\_TDD\_FR1\_C | -119 | -119 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -118.5 | -118.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -118 | -118 |
| NR\_FDD\_FR1\_G | -117 | -117 |
| NR\_FDD\_FR1\_H | -116.5 | -116.5 |
| Config 3 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -85.46 | -87.34 | -117 | -117 |
| NR\_FDD\_FR1\_B | -116.5 | -116.5 |
| NR\_TDD\_FR1\_C | -116 | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 | -115 |
| NR\_FDD\_FR1\_G | -114 | -114 |
| NR\_FDD\_FR1\_H | -113.5 | -113.5 |
| SS-SINR Note3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dB | 0 | -3.19 | -5.46 | -5.46 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -57.5 | | -85.51 | |
| NR\_FDD\_FR1\_B | -85.01 | |
| NR\_TDD\_FR1\_C | -84.51 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -84.01 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -83.51 | |
| NR\_FDD\_FR1\_G | -82.51 | |
| NR\_FDD\_FR1\_H | -82.01 | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -51.41 | | -79.41 | |
| NR\_FDD\_FR1\_B | -78.91 | |
| NR\_TDD\_FR1\_C | -78.41 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -77.91 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -77.41 | |
| NR\_FDD\_FR1\_G | -76.41 | |
| NR\_FDD\_FR1\_H | -75.91 | |
| Propagation condition | | | | - | AWGN | | | |
| Antenna configuration | | | | - | 1x2 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | |

##### A.6.7.3.1.3 Test Requirements

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

#### A.6.7.3.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.3.2.1 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.6.7.3.2.2 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.6.7.3.2.2-1. 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. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.6.7.3.2.2-1: 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.6.7.3.2.2-2: SS-SINR Inter frequency test parameters**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **Test 1** | | | **Test 2** | | **Test 3** | | |
| **Cell 1** | | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | | **Cell 2** |
| SSB ARFCN | | | |  | freq1 | | freq2 | freq1 | freq2 | freq1 | | freq2 |
| Duplex mode | | Config 1 | |  | FDD | | | | | | | |
| Config 2,3 | | TDD | | | | | | | |
| TDD configuration | | Config 1 | |  | Not Applicable | | | | | | | |
| Config 2 | | TDDConf.1.1 | | | | | | | |
| Config 3 | | TDDConf.2.1 | | | | | | | |
| Downlink initial BWP configuration | | | |  | DLBWP.0.1 | | | | | | | |
| Downlink dedicated BWP configuration | | | |  | DLBWP.1.1 | | | | | | | |
| Uplink initial BWP configuration | | | |  | ULBWP.0.1 | | | | | | | |
| Uplink dedicated BWP configuration | | | |  | ULBWP.1.1 | | | | | | | |
| DRX Cycle configuration | | | | ms | Not Applicable | | | | | | | |
| Gap pattern ID | | | |  | 0 | - | | 0 | - | | 0 | - |
| TRS Configuration | | Config 1 | |  | TRS.1.1 FDD | | - | TRS.1.1 FDD | - | TRS.1.1 FDD | | - |
|  | | Config 2 | |  | TRS.1.1 TDD | | TRS.1.1 TDD | TRS.1.1 TDD | |
|  | | Config 3 | |  | TRS.1.2 TDD | | TRS.1.2 TDD | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | Config 1 | |  | SR.1.1 FDD | | - | SR.1.1 FDD | - | SR.1.1 FDD | | - |
| Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | SR.1.1 TDD | |
| Config 3 | | SR2.1 TDD | | SR2.1 TDD | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1 | |  | CR.1.1 FDD | | - | CR.1.1 FDD | - | CR.1.1 FDD | |  |
| Config 2 | |  | CR.1.1 TDD | |  | CR.1.1 TDD |  | CR.1.1 TDD | |  |
| Config 3 | |  | CR2.1 TDD | |  | CR2.1 TDD |  | CR2.1 TDD | |  |
| Dedicated CORESET Reference Channel | | Config 1 | |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | - | CCR.1.1 FDD | | - |
| Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | CCR.1.1 TDD | |
| Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | CCR2.1 TDD | |
| OCNG Patterns | | | |  | OP.1 | | | | | | | |
| SS-RSSI-Measurement | | | |  | Not Applicable | | | | | | | |
| Time offset with Cell 1 | | Config 1 | | ms | - | 3 | | - | 3 | | - | 3 |
| Config 2,3 | | μs | - | 3 | | - | 3 | | - | 3 |
| SMTC configuration | | Config 1 | |  | SMTC pattern 2 | | | | | | | |
| Config 2,3 | | SMTC pattern 1 | | | | | | | |
| SSB configuration | | Config 1,2 | |  | SSB.1 FR1 | | | | | | | |
| Config 3 | | SSB.2 FR1 | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | | kHz | 15 | | | | | | | |
| Config 3 | | 30 | | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | | 0 | 0 | 0 | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -88 | | | -108.5 | | -119.5 | | |
| NR\_FDD\_FR1\_B | -119 | | |
| NR\_TDD\_FR1\_C | -118.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -118 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -117.5 | | |
| NR\_FDD\_FR1\_G | -116.5 | | |
| NR\_FDD\_FR1\_H | -116 | | |
| Note2 | Config 1,2 | | | dBm/SCS | -88 | | | -108.5 | | Same as Noc for 15kHz | | |
| Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -85 | | | -105.5 | | -116.5 | | |
| NR\_FDD\_FR1\_B | -116 | | |
| NR\_TDD\_FR1\_C | -115.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -115 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114.5 | | |
| NR\_FDD\_FR1\_G | -114.5 | | |
| NR\_FDD\_FR1\_H | -113 | | |
|  | | | | dB | -1.75 | | -1.75 | 20 | 20 | -4.0 | | -4.0 |
|  | | | | dB | -1.75 | | | 20 | | -4.0 | | |
| SS-RSRP Note3 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -89.75 | | | -88.5 | | -123.5 | | |
| NR\_FDD\_FR1\_B | -123 | | |
| NR\_TDD\_FR1\_C | -122.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -122 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -121.5 | | |
| NR\_FDD\_FR1\_G | -120.5 | | |
| NR\_FDD\_FR1\_H | -120 | | |
| Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -86.75 | | | -85.5 | | -120.5 | | |
| NR\_FDD\_FR1\_B | -120 | | |
| NR\_TDD\_FR1\_C | -119.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -119 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -118.5 | | |
| NR\_FDD\_FR1\_G | -117.5 | | |
| NR\_FDD\_FR1\_H | -117 | | |
| SS-SINRNote3 | | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dB | -1.75 | | | 20 | | -4.0 | | |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -57.83 | | | -60.5 | | -90.09 | | |
| NR\_FDD\_FR1\_B | -89.59 | | |
| NR\_TDD\_FR1\_C | -89.09 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -88.59 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -88.09 | | |
| NR\_FDD\_FR1\_G | -87.09 | | |
| NR\_FDD\_FR1\_H | -86.59 | | |
| Config 3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -51.73 | | | -54.41 | | -84 | | |
| NR\_FDD\_FR1\_B | -83.5 | | |
| NR\_TDD\_FR1\_C | -83 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -82.5 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -82 | | |
| NR\_FDD\_FR1\_G | -81 | | |
| NR\_FDD\_FR1\_H | -80.5 | | |
| Propagation condition | | | | - | AWGN | | | | | | | |
| Antenna configuration | | | | - | 1x2 | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | | |

##### A.6.7.3.2.3 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.6.7.4 L1-RSRP measurement for beam reporting

#### A.6.7.4.1 SSB based L1-RSRP measurement

##### A.6.7.4.1.1 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 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.6.7.4.1.1-1.

**Table A.6.7.4.1.1-1: 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.6.7.4.1.2 Test parameters

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

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.6.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | | 1~3 |  | freq1 | freq1 |
| Duplex mode | | 1 |  | FDD | FDD |
| 2 | TDD | TDD |
| 3 | TDD | TDD |
| TDD Configuration | | 1 |  | N/A | N/A |
| 2 | TDDConf.1.1 | TDDConf.1.1 |
| 3 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2 | SR.1.1 TDD | SR.1.1 TDD |
| 3 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2 | CR.1.1 TDD | CR.1.1 TDD |
| 3 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 |  | SSB.3 FR1 | SSB.3 FR1 |
| 2 | SSB.3 FR1 | SSB.3 FR1 |
| 3 | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~3 |  | OP.1 | OP.1 |
| Initial BWP Configuration | | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| TRS configuration | | 1 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3 | TRS.1.2 TDD | TRS.1.2 TDD |
| Dedicated BWP configuration | | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~3 |  | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~3 |  | periodic | periodic |
| reportQuantity | | 1~3 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1~3 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~3 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~3 | dBm/15kHz | -94.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/SSB SCS | -94.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | -91.65 | -114 |
| NR\_FDD\_FR1\_B | -113.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 |
| NR\_FDD\_FR1\_G | -111 |
| NR\_FDD\_FR1\_H | -110.5 |
|  | | 1~3 | dB | 10 | -3 |
| SSB RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/SSB SCS | -84.65 | -120 |
| NR\_FDD\_FR1\_B | -119.5 |
| NR\_TDD\_FR1\_C | -119 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -118.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -118 |
| NR\_FDD\_FR1\_G | -117 |
| NR\_FDD\_FR1\_H | -116.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | -81.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/9.36 MHz | -56.28 | -87.28 |
| NR\_FDD\_FR1\_B | -86.78 |
| NR\_TDD\_FR1\_C | -86.28 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -85.78 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -85.28 |
| NR\_FDD\_FR1\_G | -84.28 |
| NR\_FDD\_FR1\_H | -83.78 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | dBm/38.16 MHz | -50.19 | -81.19 |
| NR\_FDD\_FR1\_B | -80.69 |
| NR\_TDD\_FR1\_C | -80.19 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -79.69 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -79.19 |
| NR\_FDD\_FR1\_G | -78.19 |
| NR\_FDD\_FR1\_H | -77.69 |
|  | | 1~3 | dB | 10 | -3 |
| Propagation condition | | 1~3 |  | AWGN | AWGN |
| Antenna configuration | | 1~3 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

##### A.6.7.4.1.3 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.6.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

##### A.6.7.4.2.1 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 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.6.7.4.2.1-1.

**Table A.6.7.4.2.1-1: 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.6.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.2.2-1.

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.6.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | | 1~3 |  | freq1 | freq1 |
| Duplex mode | | 1 |  | FDD | FDD |
| 2 | TDD | TDD |
| 3 | TDD | TDD |
| TDD Configuration | | 1 |  | N/A | N/A |
| 2 | TDDConf.1.1 | TDDConf.1.1 |
| 3 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2 | SR.1.1 TDD | SR.1.1 TDD |
| 3 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2 | CR.1.1 TDD | CR.1.1 TDD |
| 3 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 |  | SSB.3 FR1 | SSB.3 FR1 |
| 2 | SSB.3 FR1 | SSB.3 FR1 |
| 3 | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~3 |  | OP.1 | OP.1 |
| TRS configuration | | 1 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~3 |  | SMTC.1 | SMTC.1 |
| CSI-RS | | 1 |  | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| 2 | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| 3 | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | | 1~3 |  | periodic | periodic |
| reportQuantity | | 1~3 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | | 1~3 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~3 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~3 | dBm/15kHz | -94.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/CSI-RS SCS | -94.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | -91.65 | -114 |
| NR\_FDD\_FR1\_B | -113.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 |
| NR\_FDD\_FR1\_G | -111 |
| NR\_FDD\_FR1\_H | -110.5 |
|  | | 1~3 | dB | 10 | -3 |
| CSI-RS RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/CSI-RS SCS | -84.65 | -120 |
| NR\_FDD\_FR1\_B | -119.5 |
| NR\_TDD\_FR1\_C | -119 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -118.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -118 |
| NR\_FDD\_FR1\_G | -117 |
| NR\_FDD\_FR1\_H | -116.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | -81.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/9.36 MHz | -56.28 | -87.28 |
| NR\_FDD\_FR1\_B | -86.78 |
| NR\_TDD\_FR1\_C | -86.28 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -85.78 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -85.28 |
| NR\_FDD\_FR1\_G | -84.28 |
| NR\_FDD\_FR1\_H | -83.78 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | dBm/38.16 MHz | -50.19 | -81.19 |
| NR\_FDD\_FR1\_B | -80.69 |
| NR\_TDD\_FR1\_C | -80.19 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -79.69 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -79.19 |
| NR\_FDD\_FR1\_G | -78.19 |
| NR\_FDD\_FR1\_H | -77.69 |
|  | | 1~3 | dB | 10 | -3 |
| Propagation condition | | 1~3 |  | AWGN | AWGN |
| Antenna configuration | | 1~3 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

##### A.6.7.4.2.3 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.6.7.5 E-UTRAN RSRP

#### A.6.7.5.1 SA: inter-RAT measurement accuracy with FR1 serving cell

##### A.6.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.2 for SA inter-RAT E-UTRAN RSRP measurements.

##### A.6.7.5.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.5.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRP are tested by using the parameters in A.6.7.5.1.2-2 and A.6.7.5.1.2-3.

**Table A.6.7.5.1.2-1: Inter-RAT E-UTRAN RSRP supported test configurations with FR1 serving cell**

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

**Table A.6.7.5.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** |
| NR RF channel number | |  | 1 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| TDD Configuration | Config 1, 4 |  | N/A |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 (FDD) |
| Config 2, 5 | 10: NRB,c = 52 (TDD) |
| Config 3, 6 | 40: NRB,c = 106 (TDD) |
| Gap pattern Id | |  | 0 |
| PDSCH reference measurement channel | Config 1, 4 |  | SR.1.1 FDD |
| Config 2, 5 | SR.1.1 TDD |
| Config 3, 6 | SR.2.1 TDD |
| RMSI CORSET reference channel | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 | CR.1.1 TDD |
| Config 3, 6 | CR.2.1 TDD |
| Dedicated CORSET reference channel | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 | CCR.1.1 TDD |
| Config 3, 6 | CCR.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 |
| BWP configurations | Initial DL BWP |  | DLBWP.0.1 |
| Dedicated DL BWP |  | DLBWP.1.1 |
| Initial UL BWP |  | ULBWP.0.1 |
| Dedicated UL BWP |  | ULBWP.1.1 |
| OCNG patternNote1 | |  | OP.1 |
| SMTC configuration | |  | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5 |  | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSS | |
| EPRE ratio of OCNG to OCNG DMRS | |
| *Noc*Note2 | | dBm/15 kHz | -104 |
| *Noc*Note2 | Config 1, 2, 4, 5 | dBm/SCS | -104 |
| Config 3, 6 | -101 |
| Ês/Noc | | dB | 17 |
| Ês/IotNote3 | | dB | 17 |
| SS-RSRPNote3 | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| Config 3, 6 | -84 |
| SSB\_RPNote3 | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| Config 3, 6 | -84 |
| IoNote3 | Config 1, 2, 4, 5 | dBm/9.36 MHz | -58.96 |
| Config 3, 6 | dBm/38.16 MHz | -52.87 |
| Propagation condition | |  | AWGN |
| Antenna Configuration and Correlation Matrix | |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table A.6.7.5.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | |
| Test 1 | Test 2 |
| E-UTRA RF channel number | |  | 1 | |
| Duplex mode | Config 1, 2, 3 |  | FDD | |
| Config 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 | Config 1, 2, 3 |  | N/A | |
| Config 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 | Config 1, 2, 3 |  | N/A | |
| Config 4, 5, 6 | 1 | |
| BWchannel | | MHz | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 | |  | - | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 | Config 1, 2, 3 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| Config 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 | Config 1, 2, 3 |  | 5 MHz: OP.19 FDD  10 MHz: OP.6 FDD  20 MHz: OP.14 FDD | |
| Config 4, 5, 6 | 5 MHz: OP.10 TDD  10 MHz: OP.2 TDD  20 MHz: OP.8 TDD | |
| PBCH\_RA | | dB | 0 | |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote3 | |
| OCNG\_RBNote3 | |
| NocNote4 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -91.65 | -117 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -116.5 |
| Bands FDD\_C, TDD\_C | -116 |
| Bands FDD\_D | -115.5 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -115 |
| Bands FDD\_G Note 8 | -114 |
| Bands FDD\_H | -113.5 |
| Ês/Noc | | dB | 10 | -4 |
| Ês/IotNote5 | | dB | 10 | -4 |
| RSRPNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -81.65 | -121 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -120.5 |
| Bands FDD\_C, TDD\_C | -120 |
| Bands FDD\_D | -119.5 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -119 |
| Bands FDD\_G Note 8 | -118 |
| Bands FDD\_H | -117.5 |
| SCH\_RPNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -81.65 | -121 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -120.5 |
| Bands FDD\_C, TDD\_C | -120 |
| Bands FDD\_D | -119.5 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -119 |
| Bands FDD\_G Note 8 | -118 |
| Bands FDD\_H | -117.5 |
| IoNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/Ch BW | -53.45 + 10log(NRB,c/50) | -87.76 + 10log(NRB,c/50) |
| Bands FDD\_B1, FDD\_B2 Note 10 | -87.26 + 10log(NRB,c/50) |
| Bands FDD\_C, TDD\_C | -86.76 + 10log(NRB,c/50) |
| Bands FDD\_D | -86.26 + 10log(NRB,c/50) |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -85.76 + 10log(NRB,c/50) |
| Bands FDD\_G Note 8 | -84.76 + 10log(NRB,c/50) |
| Bands FDD\_H | -84.26 + 10log(NRB,c/50) |
| Propagation Condition | |  | AWGN | |
| Antenna Configuration and Correlation Matrix | |  | 1x2 | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].  Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.  Note 8: Except Band 29.  Note 9: Except Band 32, Band 75 and Band 76.  Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz. | | | | |

##### A.6.7.5.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRP measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.2.

A.6.7.6 E-UTRAN RSRQ

#### A.6.7.6.1 SA: inter-RAT measurement accuracy with FR1 serving cell

##### A.6.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.3 for SA inter-RAT E-UTRAN RSRQ measurements.

##### A.6.7.6.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.6.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRQ are tested by using the parameters in A.6.7.6.1.2-2 and A.6.7.6.1.2-3.

**Table A.6.7.6.1.2-1: Inter-RAT E-UTRAN RSRQ supported test configurations with FR1 serving cell**

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

**Table A.6.7.6.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** |
| NR RF channel number | |  | 1 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| TDD Configuration | Config 1, 4 |  | N/A |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.1.2 |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 (FDD) |
| Config 2, 5 | 10: NRB,c = 52 (TDD) |
| Config 3, 6 | 40: NRB,c = 106 (TDD) |
| Gap pattern Id | |  | 0 |
| PDSCH reference measurement channel | Config 1, 4 |  | SR.1.1 FDD |
| Config 2, 5 | SR.1.1 TDD |
| Config 3, 6 | SR.2.1 TDD |
| RMSI CORSET reference channel | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 | CR.1.1 TDD |
| Config 3, 6 | CR.2.1 TDD |
| Dedicated CORSET reference channel | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 | CCR.1.1 TDD |
| Config 3, 6 | CCR.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 |
| BWP configurations | Initial DL BWP |  | DLBWP.0.1 |
| Dedicated DL BWP |  | DLBWP.1.1 |
| Initial UL BWP |  | ULBWP.0.1 |
| Dedicated UL BWP |  | ULBWP.1.1 |
| OCNG patternNote1 | |  | OP.1 |
| SMTC configuration | |  | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5 |  | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSS | |
| EPRE ratio of OCNG to OCNG DMRS | |
| *Noc*Note2 | | dBm/15 kHz | -104 |
| *Noc*Note2 | Config 1, 2, 4, 5 | dBm/SCS | -104 |
| Config 3, 6 | -101 |
| Ês/Noc | | dB | 17 |
| Ês/IotNote3 | | dB | 17 |
| SS-RSRQNote3 | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| Config 3, 6 | -84 |
| SSB\_RPNote3 | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| Config 3, 6 | -84 |
| IoNote3 | Config 1, 2, 4, 5 | dBm/9.36 MHz | -58.96 |
| Config 3, 6 | dBm/38.16 MHz | -52.87 |
| Propagation condition | |  | AWGN |
| Antenna Configuration and Correlation Matrix | |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Ês/Iot, SS-RSRQ, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

Table A.6.7.6.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | |
| Test 1 | Test 2 | Test 3 |
| E-UTRA RF channel number | |  | 1 | | |
| Duplex mode | Config 1, 2, 3 |  | FDD | | |
| Config 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 | Config 1, 2, 3 |  | N/A | | |
| Config 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 | Config 1, 2, 3 |  | N/A | | |
| Config 4, 5, 6 | 1 | | |
| BWchannel | | MHz | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 | |  | - | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 | Config 1, 2, 3 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | | |
| Config 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG PatternsNote2 | Config 1, 2, 3 |  | 5 MHz: OP.19 FDD  10 MHz: OP.6 FDD  20 MHz: OP.14 FDD | | |
| Config 4, 5, 6 | 5 MHz: OP.10 TDD  10 MHz: OP.2 TDD  20 MHz: OP.8 TDD | | |
| PBCH\_RA | | dB | 0 | | |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote3 | |
| OCNG\_RBNote3 | |
| NocNote4 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -83 | -104.70 | -119.5 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -119 |
| Bands FDD\_C, TDD\_C | -118.5 |
| Bands FDD\_D | -118 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -117.5 |
| Bands FDD\_G Note 8 | -116.5 |
| Bands FDD\_H | -116 |
| Ês/Noc | | dB | -1.75 | -4.0 | -4.0 |
| Ês/IotNote5 | | dB | -1.75 | -4.0 | -4.0 |
| RSRPNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -84.75 | -108.70 | -123.5 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -123 |
| Bands FDD\_C, TDD\_C | -122.5 |
| Bands FDD\_D | -122 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -121.5 |
| Bands FDD\_G Note 8 | -120.5 |
| Bands FDD\_H | -120 |
| RSRQNote5 | Bands FDD\_A Note 9, TDD\_A | dB | -14.76 | -16.25 | -16.25 |
| Bands FDD\_B1, FDD\_B2 Note 10 |
| Bands FDD\_C, TDD\_C |
| Bands FDD\_D |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E |
| Bands FDD\_G Note 8 |
| Bands FDD\_H |
| IoNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/Ch BW | -53 + 10log(NRB,c /50) | -75.46 + 10log(NRB,c /50) | -90.26 + 10log(NRB,c /50) |
| Bands FDD\_B1, FDD\_B2 Note 10 | -89.76 + 10log(NRB,c /50) |
| Bands FDD\_C, TDD\_C | -89.26 + 10log(NRB,c /50) |
| Bands FDD\_D | -88.76 + 10log(NRB,c /50) |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -88.26 + 10log(NRB,c /50) |
| Bands FDD\_G Note 8 | -87.26 + 10log(NRB,c /50) |
| Bands FDD\_H | -86.76 + 10log(NRB,c /50) |
| Propagation Condition | |  | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1x2 | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].  Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.  Note 8: Except Band 29.  Note 9: Except Band 32, Band 75 and Band 76.  Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz. | | | | | |

##### A.6.7.6.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRQ measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.3.

A.6.7.7 E-UTRAN RS-SINR

#### A.6.7.7.1 SA: inter-RAT measurement accuracy with FR1 serving cell

##### A.6.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.4 for SA inter-RAT E-UTRAN RS-SINR measurements.

##### A.6.7.7.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.7.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RS-SINR are tested by using the parameters in A.6.7.7.1.2-2 and A.6.7.7.1.2-3.

**Table A.6.7.7.1.2-1: Inter-RAT E-UTRAN RS-SINR supported test configurations with FR1 serving cell**

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

**Table A.6.7.7.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** |
| NR RF channel number | |  | 1 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| TDD Configuration | Config 1, 4 |  | N/A |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 (FDD) |
| Config 2, 5 | 10: NRB,c = 52 (TDD) |
| Config 3, 6 | 40: NRB,c = 106 (TDD) |
| Gap pattern Id | |  | 0 |
| PDSCH reference measurement channel | Config 1, 4 |  | SR.1.1 FDD |
| Config 2, 5 | SR.1.1 TDD |
| Config 3, 6 | SR.2.1 TDD |
| RMSI CORSET reference channel | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 | CR.1.1 TDD |
| Config 3, 6 | CR.2.1 TDD |
| Dedicated CORSET reference channel | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 | CCR.1.1 TDD |
| Config 3, 6 | CCR.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 |
| BWP configurations | Initial DL BWP |  | DLBWP.0.1 |
| Dedicated DL BWP |  | DLBWP.1.1 |
| Initial UL BWP |  | ULBWP.0.1 |
| Dedicated UL BWP |  | ULBWP.1.1 |
| OCNG patternNote1 | |  | OP.1 |
| SMTC configuration | |  | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5 |  | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSS | |
| EPRE ratio of OCNG to OCNG DMRS | |
| *Noc*Note2 | | dBm/15 kHz | -104 |
| *Noc*Note2 | Config 1, 2, 4, 5 | dBm/SCS | -104 |
| Config 3, 6 | -101 |
| Ês/Noc | | dB | 17 |
| Ês/IotNote3 | | dB | 17 |
| SS-RS-SINRNote3 | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| Config 3, 6 | -84 |
| SSB\_RPNote3 | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| Config 3, 6 | -84 |
| IoNote3 | Config 1, 2, 4, 5 | dBm/9.36 MHz | -58.96 |
| Config 3, 6 | dBm/38.16 MHz | -52.87 |
| Propagation condition | |  | AWGN |
| Antenna Configuration and Correlation Matrix | |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Ês/Iot, SS-RS-SINR, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table A.6.7.7.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | |
| Test 1 | Test 2 | Test 3 |
| E-UTRA RF channel number | |  | 1 | | |
| Duplex mode | Config 1, 2, 3 |  | FDD | | |
| Config 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 | Config 1, 2, 3 |  | N/A | | |
| Config 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 | Config 1, 2, 3 |  | N/A | | |
| Config 4, 5, 6 | 1 | | |
| BWchannel | | MHz | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 | |  | - | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 | Config 1, 2, 3 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | | |
| Config 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG PatternsNote2 | Config 1, 2, 3 |  | 5 MHz: OP.19 FDD  10 MHz: OP.6 FDD  20 MHz: OP.14 FDD | | |
| Config 4, 5, 6 | 5 MHz: OP.10 TDD  10 MHz: OP.2 TDD  20 MHz: OP.8 TDD | | |
| PBCH\_RA | | dB | 0 | | |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote3 | |
| OCNG\_RBNote3 | |
| NocNote4 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -88 | -108.50 | -119.5 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -119 |
| Bands FDD\_C, TDD\_C | -118.5 |
| Bands FDD\_D | -118 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -117.5 |
| Bands FDD\_G Note 8 | -116.5 |
| Bands FDD\_H | -116 |
| CRS Ês/Noc1 | | dB | -1.75 | 20.0 | -4.0 |
| CRS Ês/IotNote5 | | dB | -1.75 | 20.0 | -4.0 |
| RSRPNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/15kHz | -89.75 | -88.50 | -123.5 |
| Bands FDD\_B1, FDD\_B2 Note 10 | -123 |
| Bands FDD\_C, TDD\_C | -122.5 |
| Bands FDD\_D | -122 |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -121.5 |
| Bands FDD\_G Note 8 | -120.5 |
| Bands FDD\_H | -120 |
| RS-SINRNote5 | Bands FDD\_A Note 9, TDD\_A | dB | -1.75 | 20 | -4.0 |
| Bands FDD\_B1, FDD\_B2 Note 10 |
| Bands FDD\_C, TDD\_C |
| Bands FDD\_D |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E |
| Bands FDD\_G Note 8 |
| Bands FDD\_H |
| IoNote5 | Bands FDD\_A Note 9, TDD\_A | dBm/Ch BW | -53.79 + 10log(NRB,c /50) | -60.56 + 10log(NRB,c /50) | -93.48 + 10log(NRB,c /50) |
| Bands FDD\_B1, FDD\_B2 Note 10 | -92.98 + 10log(NRB,c /50) |
| Bands FDD\_C, TDD\_C | -92.48 + 10log(NRB,c /50) |
| Bands FDD\_D | -91.98 + 10log(NRB,c /50) |
| Bands FDD\_E, FDD\_F Note 7, TDD\_E | -91.48 + 10log(NRB,c /50) |
| Bands FDD\_G Note 8 | -90.48 + 10log(NRB,c /50) |
| Bands FDD\_H | -89.98 + 10log(NRB,c /50) |
| Propagation Condition | |  | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1x2 | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over CRS subcarriers and time and shall be modelled as AWGN of appropriate power for Noc1 to be fulfilled.  Note 4a: Void.  Note 5: CRS Ês/Iot, RSRP, RS-SINR and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].  Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.  Note 8: Except Band 29.  Note 9: Except Band 32, Band 75 and Band 76.  Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz. | | | | | |

##### A.6.7.7.1.3 Test Requirements

The SA inter-RAT E-UTRAN RS-SINR measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.4.

# A.7 NR standalone tests with one or more NR cells in FR2

## A.7.1 SA: RRC\_IDLE state mobility

A.7.1.1 Cell re-selection to NR

#### A.7.1.1.1 Cell reselection to FR2 intra-frequency NR case

##### A.7.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

##### A.7.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.1.1.1.2-1, A.7.1.1.1.2-2 and A.7.1.1.1.2-3. 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.

**Table A.7.1.1.1.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.7.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case**

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

Table A.7.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC |  | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| configuration |  | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC configuration |  | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| RMC configuration |  | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration |  | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
|  |  | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern |  | 1, 2 | OP.4 | | | OP.4 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1, 2 | 66 | | | 66 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -138 | | | -138 | | |
|  |  | 2 | -135 | | | -135 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.3.15.1 | | | Setup 1 defined in A.3.15.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | | |
| Note 5 | dB | 1 | 7.45 | -3.55 | 0.95 | -infinity | 0.95 | -3.55 |
|  |  | 2 |
| Note2 | dBm/SCS | 1 | -93 | | | | | |
|  |  | 2 | -90 | | | | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | | | |
|  |  | 2 |  | | | | | |
|  | dB | 1 | 8 | -3 | 1.5 | -infinity | 1.5 | -3 |
|  |  | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85 | -96 | -91.5 | -infinity | -91.5 | -96 |
|  |  | 2 | -82 | -93 | -88.5 | -infinity | -88.5 | -93 |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -60.53 | -67.40 | -65.34 | -69.17 | -65.34 | -67.40 |
| 2 | -57.52 | -64.39 | -62.33 | -66.16 | -62.33 | -64.39 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |

##### A.7.1.1.1.3 Test Requirements

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 130 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 27 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 4.2.2.3-1 in clause 4.2.2.3

Tevaluate, NR\_ intra See Table 4.2.2.3-1 in clause 4.2.2.3

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

This gives a total of 129.28 s, allow 130 s for the cell re-selection delay to a newly detectable cell and 26.88 s for the cell re-selection delay to an already detected cell in the test case, which we allow 27 s.

#### A.7.1.1.2 Cell reselection to FR2 inter-frequency NR case

##### A.7.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

##### A.7.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.7.1.1.2.2-1, A.7.1.1.2.2-2 and A.7.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 2.

**Table A.7.1.1.2.2-1: Supported test configurations**

|  |  |  |
| --- | --- | --- |
| **Configuration** | **Description for serving cell** | **Description for target cell** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

**Table A.7.1.1.2.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case**

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

Table A.7.1.1.2.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1, 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET parameters |  | 1, 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | | -140 | | |
| 2 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.3.15.1 | | | Setup 1 defined in A.3.15.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | | |
| Note 5 | dB | 1 | 9.95 | 9.95 | 7.45 | -11.05 | -infinity | 7.95 |
| 2 |
| Note2 | dBm/SCS | 1 | -93 | | | -93 | | |
| 2 | -90 | | | -90 | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | -102 | | |
| 2 |
|  | dB | 1 | 10.5 | 10.5 | 8 | -10.5 | -infinity | 8.5 |
| 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | —82.5 | -82.5 | -85 | -103.5 | -infinity | -84.5 |
| 2 | -79.5 | -79.5 | -82 | -100.5 | -infinity | -81.5 |
| Io | dBm/95.04 MHz | 1, 2 | -53.11 | -53.11 | -55.34 | -63.61 | -63.98 | -54.91 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Threshx, highP | dB | 1, 2 | 48 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2 | 44 | | | 44 | | |
| Threshx, lowP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |

##### A.7.1.1.2.3 Test Requirements

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

The cell re-selection delay to a higher priority cell shall be less than 87 s.

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

The cell re-selection delay to a lower priority cell shall be less than 27 s.

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

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

Where:

Thigher\_priority\_search See clause 4.2.2.7

Tevaluate, NR\_ inter See Table 4.2.2.4-1 in clause 4.2.2.4

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

This gives a total of 86.88 s, allow 87 s for the cell re-selection delay to a higher priority cell and 26.88 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 27 s.

## A.7.2 SA: RRC\_INACTIVE state mobility

## A.7.3 RRC\_CONNECTED state mobility

### A.7.3.1 Handover

#### A.7.3.1.1 Inter-frequency handover from FR1 to FR2; unknown target cell

##### A.7.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR2 inter frequency handover requirements specified in clause 6.1.1.5.

##### A.7.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.1.2-2, and A.7.3.1.1.2-3.

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.

Table A.7.3.1.1.2-1: Inter-frequency handover from FR1 to FR2 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.7.3.1.1.2-2: General test parameters Inter-frequency handover from FR1 to FR2

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

Table A.7.3.1.1.2-3: Cell specific test parameters for NR FR1-FR2 Inter frequency handover test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | | | |  | N/A | | | Rough | | |
| AoA setup | | | |  | NA | | | Setup 1  as defined in A.3.15 | | |
| NR RF Channel Number | | | |  | 1 | | | 2 | | |
| Duplex mode | | | Config 1 |  | FDD | | TDD | | | |
| Config 2,3 | TDD | | TDD | | | |
| TDD configuration | | | Config 1 |  | Not Applicable | | TDDConf.3.1 | | | |
| Config 2 | TDDConf.1.1 | | TDDConf.3.1 | | | |
| Config 3 | TDDConf.2.1 | | TDDConf.3.1 | | | |
| BWchannel | | | Config 1 | MHz | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | | | |
| BWP BW | | | Config 1 | MHz | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | | | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | | | |
|  | | | Config 1 |  | 52 | | 66 | | | |
| Data RBs allocated | | | Config 2 |  | 52 | | 66 | | | |
|  | | | Config 3 |  | 106 | | 66 | | | |
| DRx Cycle | | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | Config 1 |  | SR.1.1 FDD | | SR.3.1 TDD | | | |
| Config 2 | SR.1.1 TDD | | SR.3.1 TDD | | | |
| Config 3 | SR2.1 TDD | | SR.3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 |  | CR.1.1 FDD | | CR.3.1 TDD | | | |
| Config 2 | CR.1.1 TDD | | CR.3.1 TDD | | | |
| Config 3 | CR2.1 TDD | | CR.3.1 TDD | | | |
| Control Channel RMC | | | Config 1 |  | CCR.1.1 FDD | | CCR.3.1 TDD | | | |
|  | | | Config 2 |  | CCR.1.1 TDD | | CCR.3.1 TDD | | | |
|  | | | Config 3 |  | CCR.2.1 TDD | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | |  | OP.1 | | | | | |
| SSB configuration | | | Config 1,2 |  | SSB.1 FR1 | | SSB.3 FR2 | | | |
| Config 3 | SSB.2 FR1 | | SSB.3 FR2 | | | |
| SSB configuration | | | Config 1,2 |  | SSB.1 FR1 | | SSB.3 FR2 | | | |
| Config 3 | SSB.2 FR1 | | SSB.3 FR2 | | | |
| SMTC configuration | | | Config 1,2 |  | SMTC.1 | | SMTC.1 | | | |
| Config 3 | SMTC.2 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | 120 kHz | | | |
| Config 3 | 30 kHz | | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | | Config 1,2 | kHz | 15 kHz | | 120 kHz | | | |
| Config 3 | 30 kHz | | 120 kHz | | | |
| PRACH configuration | | | |  | FR1 PRACH configuration 1 | | FR2 PRACH configuration 1 | | | |
| TRS configuration | | Config 1 | |  | TRS.1.1 FDD | | TRS.2.1 TDD | | | |
| Config 2 | | TRS.1.1 TDD | | TRS.2.1 TDD | | | |
| Config 3 | | TRS.1.2 TDD | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | |  | N/A | | TCI.State.2 | | | |
| BWP configuraiton | | | Initial DL BWP |  | DLBWP.0.1 | | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | | | | dBm/15kHz | Link only, see clause A.3.7A | | -104.7 | | | |
| Note2 | Config 1,2 | | | dBm/SCS | -95.7 | | | |
| Config 3 | | | -95.7 | | | |
|  | | | | dB | -Infinity | | 10 | |
|  | | | | dB | -Infinity | | 10 | |
| IoNote3 | Config 1,2 | | | dBm/  BW | -66.7 | | -56.3 | |
| Config 3 | | | dBm/  BW | -66.7 | | -56.3 | |
| Propagation condition | | | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

##### A.7.3.1.1.3 Test Requirements

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

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

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

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

Tinterrupt = 562 ms in the test. Tinterrupt is defined in clause 6.1.1.5.2.

This gives a total of 572 ms.

#### A.7.3.1.2 Intra-frequency handover from FR2 to FR2; unknown target cell

##### A.7.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 intra frequency handover requirements specified in clause 6.1.1.4.

##### A.7.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.2.2-2, and A.7.3.1.2.2-3.

The test scenario comprises of 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.

Table A.7.3.1.2.2-1: Intra-frequency handover from FR2 to FR2 test configurations

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

Table A.7.3.1.2.2-2: General test parameters Intra-frequency handover from FR2 to FR2

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

Table A.7.3.1.2.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency handover test case

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | | | Cell 2 | | |
| T1 | | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | |  | Rough | | | | Rough | | |
| AoA setup | |  | Setup 1 as defined in A.3.15 | | | | | | |
| NR RF Channel Number | |  | 1 | | | | 1 | | |
| Duplex mode | |  | TDD | | | | | | |
| TDD configuration | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | |  | 66 | | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | | | | | | |
| Control Channel RMC | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | | |
| SMTC Configuration | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | |  | SSB.3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | | | | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | |  | TCI.State.2 | | | | | | |
| BWP configuraiton | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | dBm/15kHz | -104.7 | | | | | | |
| Note2 | | dBm/SCS | -95.7 | | | | | | |
|  | | dB | 6 | -1.8 | | -Infinity | | 0 | |
|  | | dB | 6 | 6 | | -Infinity | | 7 | |
| IoNote3 | | dBm/  BW | -59.7 | -56.7 | | -59.7 | | -56.7 | |
| Propagation condition | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | |

##### A.7.3.1.2.3 Test Requirements

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

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

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

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

Tinterrupt = 222 ms in the test. Tinterrupt is defined in clause 6.1.1.4.2.

This gives a total of 232 ms.

#### A.7.3.1.3 Inter-frequency handover from FR2 to FR2; unknown target cell

##### A.7.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 inter frequency handover requirements specified in clause 6.1.1.4.

##### A.7.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.3.2-2, and A.7.3.1.3.2-3.

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.

Table A.7.3.1.3.2-1: Inter-frequency handover from FR2 to FR2 test configurations

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

Table A.7.3.1.3.2-2: General test parameters Inter-frequency handover from FR2 to FR2

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

Table A.7.3.1.3.2-3: Cell specific test parameters for NR FR2-FR2 Inter frequency handover test case

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | | | Cell 2 | | |
| T1 | | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | |  | Rough | | | | Rough | | |
| AoA setup | |  | Setup 1 as defined in A.3.15 | | | | | | |
| NR RF Channel Number | |  | 1 | | | | 2 | | |
| Duplex mode | |  | TDD | | | | | | |
| TDD configuration | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | |  | 66 | | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | | | | | | |
| Control Channel RMC | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | | |
| SMTC Configuration | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | |  | SSB.3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | | | | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | |  | TCI.State.2 | | | | | | |
| BWP configuraiton | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | dBm/15kHz | -104.7 | | | -104.7 | | | |
| Note2 | | dBm/SCS | -95.7 | | | -95.7 | | | |
|  | | dB | 5 | 5 | | -Infinity | | 5 | |
|  | | dB | 5 | 5 | | -Infinity | | 5 | |
| IoNote3 | | dBm/  BW | -60.5 | -60.5 | | -66.7 | | -60.5 | |
| Propagation condition | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | |

##### A.7.3.1.3.3 Test Requirements

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

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

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

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

Tinterrupt = 542 ms in the test. Tinterrupt is defined in clause 6.1.1.4.2.

This gives a total of 552 ms.

A.7.3.2 RRC Connection Mobility Control

#### A.7.3.2.1 SA: RRC Re-establishment

##### A.7.3.2.1.1 Intra-frequency RRC Re-establishment in FR2

A.7.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.1.1-1, table A.7.3.2.1.1.1-2 and table A.7.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

**Table A.7.3.2.1.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| Neighbour cells |  | 1 | Cell2 |  |
| Final condition | Active cell |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1 |  |
| Time offset between cells | |  | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| SMTC configuration | |  | 1 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1 | OFF |  |
| PRACH configuration | |  | 1 | FR2 PRACH configuration 1 | Table A.3.8.3.1-1 |
| T1 | | s | 1 | 5 |  |
| T2 | | s | 1 | 5 | Time for the UE to detect RLF |
| T3 | | s | 1 | 5 |  |

**Table A.7.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Assumption for UE beamsNote 4 |  |  | Rough | | | Rough | | |
| TDD configuration |  | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1 | 24 | | | 24 | | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| TRS configuration |  | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern |  | 1 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
| AoA setup |  | 1 | Setup 1 defined in A.3.15.1 | | | Setup 1 defined in A.3.15.1 | | |
|  | dB | 1 | -0.12 | -infinity | -infinity | -3.46 | 2 | 2 |
| Note2 | dBm/15 kHz | 1 | -104.7 | | | | | |
| Note2 | dBm/SCS | 1 | -95.7 | | | | | |
|  | dB | 1 | 4 | -infinity | -infinity | 2 | 2 | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -91.7 | -infinity | -infinity | -93.7 | -93.7 | -93.7 |
| Io | dBm/95.04 MHz | 1 | -59.64 | -62.59 | -62.59 | -59.94 | -62.59 | -62.59 |
| Propagation Condition |  | 1 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

A.7.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

Nfreq = 1

Tidentify\_intra\_NR = 3250 ms

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

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

##### A.7.3.2.1.2 Inter-frequency RRC Re-establishment in FR2

A.7.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.2.1-1, table A.7.3.2.1.2.1-2 and table A.7.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

**Table A.7.3.2.1.2.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.1.2.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| Neighbour cells |  | 1 | Cell2 |  |
| Final condition | Active cell |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1, 2 |  |
| Time offset between cells | |  | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| SMTC configuration | |  | 1 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1 | OFF |  |
| PRACH configuration | |  | 1 | FR2 PRACH configuration 1 | Table A.3.8.3.1-1 |
| T1 | | s | 1 | 5 |  |
| T2 | | s | 1 | 5 | Time for the UE to detect RLF |
| T3 | | s | 1 | 6 |  |

**Table A.7.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beamsNote 4 |  |  | Rough | | | Rough | | |
| AoA setup |  | 1 | Setup 3 as specified in clause A.3.15 | | | | | |
| AoA1 | | | AoA2 | | |
| TDD configuration |  | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1 | 24 | | | 24 | | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | | N/A | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| TRS configuration |  | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern |  | 1 | OP.3 defined in A.3.2.1 | | | OP.3 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
| Note2 | dBm/15 kHz | 1 | -92.1 | | | -92.1 | | |
| Note2 | dBm/SCS | 1 | -83.1 | | | -83.1 | | |
|  | dB | 1 | 0 | -infinity | -infinity | -infinity | -infinity | 0 |
| BB Note 5 | dB | 1 | -1.01 | -infinity | -infinity | -infinity | -infinity | -1.01 |
| SSB\_RP Note3 | dBm/SCS | 1 | -83.1 | -infinity | -infinity | -infinity | -infinity | -83.1 |
| Io | dBm/95.04 MHz | 1 | -55.46 | -58.51 | -58.51 | -58.51 | -58.51 | -55.46 |
| Propagation Condition |  | 1 | AWGN | | | AWGN | | |
| Note 1: OCNG shall be used such that a constant total transmitted power 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: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |

A.7.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

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 = 1600 ms

Tidentify\_inter\_NR = 2080 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 5025 ms, allow 6 s in the test case.

##### A.7.3.2.1.3 Intra-frequency RRC Re-establishment in FR2 without serving cell timing

###### A.7.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.3.1-1, table A.7.3.2.1.3.1-2 and table A.7.3.2.1.3.1-3 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.

Table A.7.3.2.1.3.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| Neighbour cells |  | 1 | Cell2 |  |
| Final condition | Active cell |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1 |  |
| Time offset between cells | |  | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
| SMTC configuration | |  | 1 | SMTC pattern 1 |  |
| DRX cycle length | | s | 1 | OFF |  |
| PRACH configuration | |  | 1 | FR2 PRACH configuration 1 | Table A.3.8.3.1-1 |
| T1 | | s | 1 | 5 |  |
| T2 | | s | 1 | 11 | Time for the UE to detect RLF |
| T3 | | s | 1 | 5 |  |

Table A.7.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Assumption for UE beamsNote 4 |  |  | Rough | | | Rough | | |
| TDD configuration |  | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration |  | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern |  | 1 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
| AoA setup |  | 1 | Setup 1 defined in A.3.15.1 | | | Setup 1 defined in A.3.15.1 | | |
|  | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| Note2 | dBm/15kHz | 1 | -104.7 | | | | | |
| Note2 | dBm/SCS | 1 | -95.7 | | | | | |
|  | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -90.7 | -infinity | -infinity | -infinity | -infinity | -90.7 |
| Io | dBm/95.04 MHz | 1 | -60.52 | -66.71 | -60.52 | -60.52 | -66.71 | -60.52 |
| Propagation Condition |  | 1 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

###### A.7.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

Nfreq = 1

Tidentify\_intra\_NR = 3520 ms

TSI = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

TPRACH = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

#### A.7.3.2.2 Random Access

##### A.7.3.2.2.1 Contention based random access test in FR2 for NR Standalone

A.7.3.2.2.1.1 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 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.1.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.1.1-2 and Table A.7.3.2.2.1.1-3.

**Table A.7.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR2 for NR Standalone**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for NR Standalone**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test-1** | **Comments** |
| SSB Configuration | Config 1 |  | SSB.1 FR2 | As defined in A.3.10 |
| CSI-RS for tracking | Config 1 |  | TRS.2.1 TDD |  |
| Duplex Mode for Cell 1 | Config 1 |  | TDD |  |
| TDD Configuration | Config 1 |  | TDDConf.3.1 | As defined in A.3.1.4 |
| BWchannel | Config 1 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | Config 1 |  | 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | Config 1 |  | SR.3.1 TDD | As defined in A.3.1.1. |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD | As defined in A.3.1.2 |
| NR RF Channel Number | |  | 1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | dB |  |
| *ss-PBCH-BlockPower* | | dBm/ SCS | +20 +ΔUL | As defined in TS 38.331 [2].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| PRACH Configuration | |  | FR2 PRACH configuration 1 | As defined in A.3.8.3, with exceptions as defined below |
| *rsrp-ThresholdSSB* | | dBm | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | | dBm | -100 | As defined in TS 38.331 [2] |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | |

**Table A.7.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for NR Standalone**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test-1** | **Comments** |
| AoA setup | | |  | Setup 1 | As defined in A.3.15.1 |
| Assumption for UE beamsNote 3 | | |  | Rough |  |
| SSB with index 0 | Es Note1 | | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | | dBm/SCS | -80.6 |
| Es/IotBB | | dB | 21.09 |  |
| Io | | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 |
| Es/IotBB | dB | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | | - | AWGN |  |
| Note 1: No articial noise is applied in this test.  Note 2: Void.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.7.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.7.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.7.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.7.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.7.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

A.7.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

A.7.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

A.7.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

##### A.7.3.2.2.2 Non-contention based random access test in FR2 for NR Standalone

A.7.3.2.2.2.1 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 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.2.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.2.1-2 and Table A.7.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

**Table A.7.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for NR Standalone**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR2 for NR Standalone**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test-1** | **Test-2** | **Comments** |
| SSB Configuration | Config 1 |  | SSB.1 FR2 | SSB.1 FR2 | As defined in A.3.10 |
| CSI-RS for tracking | Config 1 |  | TRS.2.1 TDD | TRS.2.1 TDD |  |
| CSI-RS Configuration | Config 1 |  | N/A | CSI-RS.3.1 TDD | As defined in A.3.1.4 |
| Duplex Mode for Cell 1 | Config 1 |  | TDD | TDD |  |
| TDD Configuration | Config 1 |  | TDDConf.3.1 | TDDConf.3.1 |  |
| BWchannel | Config 1 | MHz | 100: NRB,c = 66 | 100: NRB,c =66 |  |
| Data RBs allocated | Config 1 |  | 24 | 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | OP.3 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | Config 1 |  | SR3.1 TDD | SR3.1 TDD | As defined in A.3.1.1. |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| NR RF Channel Number | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | dB |  |
| *ss-PBCH-BlockPower* | | dBm/ SCS | +20 +ΔUL | +20 +ΔUL | As defined in TS 38.331 [2].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| PRACH Configuration | |  | FR2 PRACH configuration 2 | FR2 PRACH configuration 3 | As defined in A.3.8.3, with exceptions as defined below. |
| *rsrp-ThresholdSSB* | | dBm | RSRP\_69 +ΔDL | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | | dBm | -100 | -100 | As defined in TS 38.331 [2] |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | | |

**Table A.7.3.2.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test-1** | **Test-2** | **Comments** |
| AoA setup | |  | Setup 1 | Setup 1 | As defined in A.3.15.1 |
| Assumption for UE beamsNote 3 | |  | Rough | Rough |  |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -80.6 | -80.6 |
| Es/IotBB | dB | 21.09 | 21.09 |  |
| Io | dBm/95.04 MHz | -56.01 | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 | -95.0 |
| Es/IotBB | dB | 6.69 | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | AWGN | AWGN |  |
| Note 1: No articial noise is applied in this test.  Note 2: void.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.7.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.7.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.7.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.7.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.7.3.2.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.3 SA: RRC Connection Release with Redirection

##### A.7.3.2.3.1 Redirection from NR in FR2 to NR in FR2

A.7.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

A.7.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.7.3.2.3.1.2-2, and A.7.3.2.3.1.2-3.

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.

Table A.7.3.2.3.1.2-1: Redirection from NR to NR test configurations

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

Table A.7.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 3.2 |  |

**Table A.7.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | | | **Cell 2** | | |
| **T1** | | **T2** | | **T1** | | **T2** |
| Assumption for UE beamsNote 6 | |  | Rough | | | | Rough | | |
| AoA setup | |  | Setup 1 as defined in A.3.15 | | | | | | |
| NR RF Channel Number | |  | 1 | | | | 2 | | |
| Duplex mode | |  | TDD | | | | | | |
| TDD configuration | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | |  | 66 | | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | | | | | | |
| Control Channel RMC | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | | |
| SMTC configuration | |  | SMTC.1 FR2 | | | | | | |
| SSB Configuration | |  | SSB.3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | | | | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | |  | TCI.State.2 | | | | | | |
| BWP configuraiton | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | dBm/15kHz | -104.7 | | | -104.7 | | | |
| Note2 | | dBm/SCS | -95.7 | | | -95.7 | | | |
|  | | dB | 5 | 5 | | -Infinity | | 5 | |
|  | | dB | 5 | 5 | | -Infinity | | 5 | |
| IoNote3 | | dBm/  BW | -60.5 | -60.5 | | -66.7 | | -60.5 | |
| Propagation condition | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zonee  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | |

A.7.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH,

where:

TRRC\_procedure\_delay = 110 ms in the test.

Tidentify-NR = 1760 ms in the test.

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

T RACH = 10 ms in the test.

This gives a total of 3160 ms.

## A.7.4 Timing

A.7.4.1 UE transmit timing

#### A.7.4.1.1 NR UE Transmit Timing Test for FR2

##### A.7.4.1.1.1 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 7.1.2.

Supported test configurations are shown in Table 7.4.1.1.1-1.

**Table A.7.4.1.1.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

For this test a single NR cell is used. Tables A.7.4.1.1.1-2 and A.7.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.7.4.1.1.1-3.

**Table A.7.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test1 | | | Test2 | |
| SSB ARFCN |  | 1 | Freq1 | | | Freq1 | |
| TDD configuration |  | 1 | | TDDConf.3.1 | | | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | | | | |
| Data RBs allocated |  | 1 | 66 | | | | |
| Initial BWP Configuration |  | 1 | DLBWP.0.1  ULBWP.0.1 | | | | |
| Dedicated BWP Configuration |  | 1 | DLBWP.1.1  ULBWP.1.1 | | | | |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | | |
| DRx Cycle | ms | 1 | N/A | | | | DRX.8Note5 |
| PDSCH Reference measurement channel |  | 1 | SR.3.3 TDD | | | | |
| RMSI CORESET Reference Channel |  | 1 | CR.3.2 TDD | | | | |
| Dedicated CORESET Reference Channel |  | 1 | CCR.3.7 TDD | | | | |
| OCNG Patterns |  | 1 | OP.1 | | | | |
| SSB Configuration |  | 1 | SSB.4 FR2 | | | | |
| SMTC Configuration |  | 1 | SMTC.1 | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 120 | | | | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation condition |  | 1 | AWGN | | | | |
| SRS Config |  | 1 | SRSConf.1Note6 | | SRSConf.2Note6 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: DRx related parameters are given in Table A.3.3.8-1  Note 6: SRS configs are given in Table A.7.4.1.1.1-3 | | | | | | | |

Table A.7.4.1.1.1-2A: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -100 | |
|  | dB | 4 | |
| SSB\_RPNote2 | dBm/SCS Note4 | -96 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

**Table A.7.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |  |
| srs-ResourceIdList | 0 | 0 |  |
| resourceType | Periodic | Periodic |  |
| Usage | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 |  |
| nrofSRS-Ports | Port1 | Port1 |  |
| transmissionComb | n2 | n2 |  |
| combOffset-n2 | 0 | 0 |  |
| cyclicShift-n2 | 0 | 0 |  |
| resourceMapping  startPosition | 0 | 0 |  |
| resourceMapping  nrofSymbols | n1 | n1 |  |
| resourceMapping  repetitionFactor | n1 | n1 |  |
| freqDomainPosition | 0 | 0 |  |
| freqDomainShift | 0 | 0 |  |
| freqHopping  c-SRS | 17 | 17 | Matches NRB,c |
| freqHopping  b-SRS | 0 | 0 |  |
| freqHopping  b-hop | 0 | 0 |  |
| groupOrSequenceHopping | Neither | Neither |  |
| resourceType | Periodic | Periodic |  |
| periodicityAndOffset-p | sl1, 0 | sl2560, 4 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | Any 10 bit number |

Table A.7.4.1.1.1-4: Void

##### A.7.4.1.1.2 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.7.4.1.1.1-1.

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 of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 13792

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.7.4.1.1.2-1

**Table A.7.4.1.1.2-1 Adjustment Value for DL Timing**

|  |  |  |
| --- | --- | --- |
| **SCS of SSB signals (kHz)** | **Adjustment Value** | |
|  | **Test1** | **Test2** |
| 240 | +8\*64Tc | +4\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX confiured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

A.7.4.2 UE timer accuracy

A.7.4.3 Timing advance

#### A.7.4.3.1 SA FR2 timing advance adjustment accuracy

##### A.7.4.3.1.1 Test Purpose and Environment

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

##### A.7.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.7.4.3.1.2-2, A.7.4.3.1.2-3 and A.7.4.3.1.2-4.

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.7.4.3.1.2-3, 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.7.4.3.1.2-2. 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 7.3.2.1, the UE adjusts its uplink timing at slot n+k+1 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.

**Table A.7.4.3.1.2-1: Timing advance supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.4.3.1.2-2: General test parameters for timing advance**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF channel number |  | 1 |  |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *For 120 kHz SCS NTA\_new = NTA\_old + 1024\*Tc* (based on equation in clause 4.2 of TS 38.213 [3]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

Table A.7.4.3.1.2-3: Cell specific test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test1 | |
| T1 | T2 |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | |
| BWP BW | MHz | 100: NRB,c = 66 | |
| DRx Cycle | ms | Not Applicable | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | |
| CORESET Reference Channel |  | CR.3.1 TDD | |
| OCNG Patterns |  | OCNG pattern 1 | |
| TRS configuration |  | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state |  | TCI.State.2 | |
| SMTC configuration |  | SMTC.1 FR2 | |
| SSB Configuration |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 kHz | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation condition | - | AWGN | |
| Note 1: OCNG shall be used such that the resources in the cell in this test are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone | | | |

Table A.7.4.3.1.2-3A: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | |
|  |  | T1 | T2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -103 | |
|  | dB | 4 | |
| SS-RSRPNote2 | dBm/SCS Note4 | -99 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

Table A.7.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 |
| b-hop | 0 |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=4 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 |
| repetitionFactor | n1 |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

##### A.7.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where *k* = 11.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3.2.2.

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

## A.7.5 Signaling characteristics

A.7.5.1 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:

*Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.*

#### A.7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.7.5.1.1.1 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 FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.7.5.1.1.1-1. The test parameters are given in Tables A.7.5.1.1.1-2, A.7.5.1.1.1-3, and A.7.5.1.1.1-4 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.7.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.7.5.1.1.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

**Table A.7.5.1.1.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Table A.7.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.4 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.5 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | *gp0* |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 9.68 |
| T3 | | | s | 9.68 |
| D1 | | | s | 9.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.7.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | |
| AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 5 | |  | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| ssb-Index 0 SNR | Config 1 | dB | 2Note 6 | -6Note 6 | -15 |
| ssb-Index 1 SNR | Config 1 |  | Not sent | | | 2Note 6 | -15 | -15 |
|  | Config 1 | dBm/ 15kHz | -92.1 | | | -92.1 | | |
| Time multiplexing of the downlink transmissions from each AoA | |  | Defined in Figure A.7.5.1.1.1-2 | | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | |

**Table A.7.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| gapOffset | 0 |

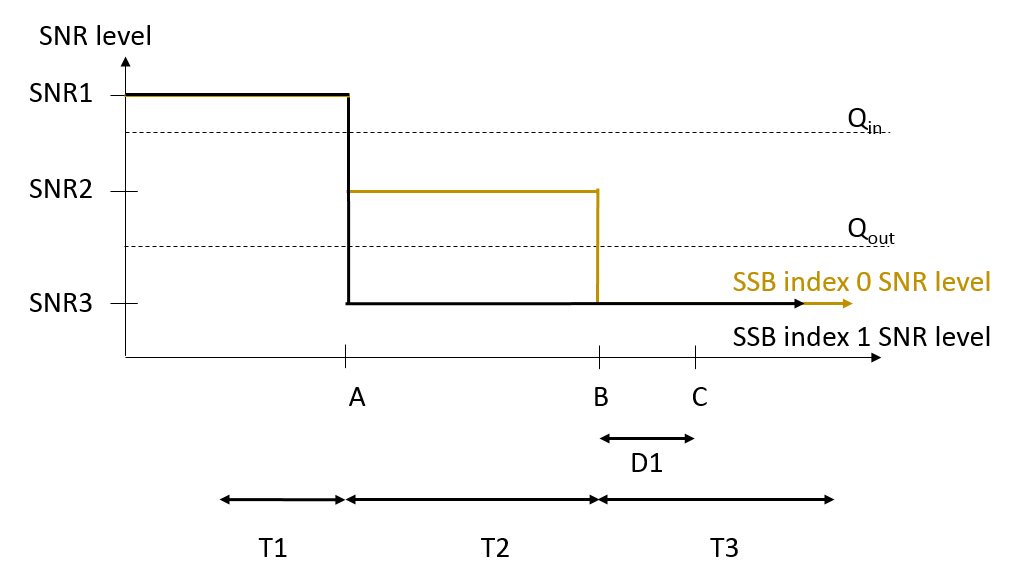


Figure A.7.5.1.1.1-1: SNR variation for out-of-sync testing



Figure A.7.5.1.1.1-2: Time multiplexed downlink transmissions

##### A.7.5.1.1.2 Test Requirements

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

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

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

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

#### A.7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.7.5.1.2.1 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 FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.7.5.1.2.1-1.The test parameters are given in Tables A.7.5.1.2.1-2, and A.7.5.1.2.1-3 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.7.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.7.5.1.2.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

**Table A.7.5.1.2.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

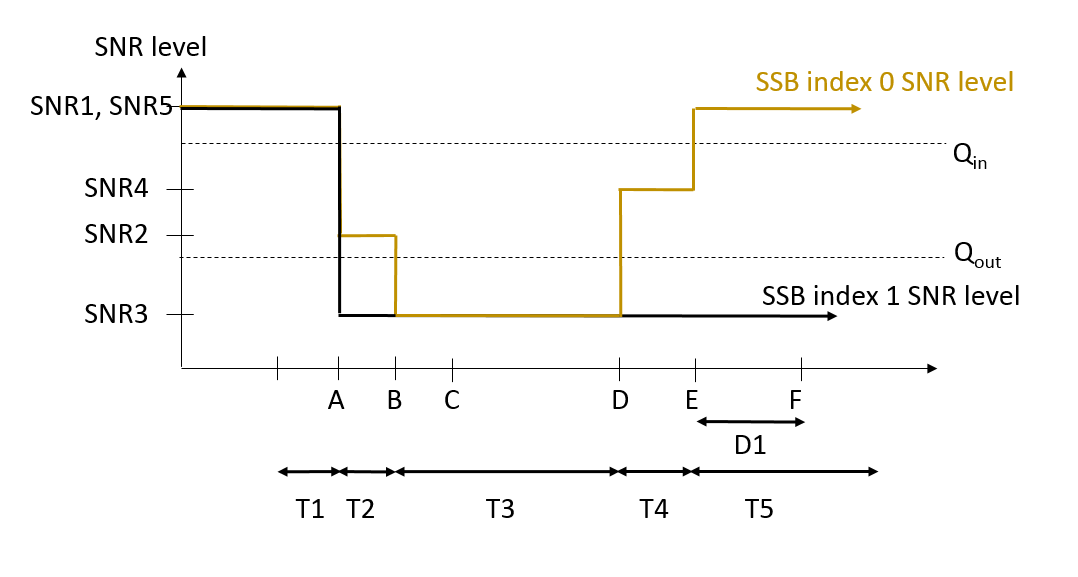
Table A.7.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.1 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.5 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 1.88 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.84 |
| D1 | | | s | 3.8 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.7.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | | | | | |
| AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beams Note 5 | |  | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| ssb-Index 0 SNR | Config 1 | dB | 2Note 6 | -6Note 6 | -15 | -4.5 | 2Note 6 |
| ssb-Index 1 SNR | Config 1 |  | Not sent | | | | | 2Note 6 | -15 | -15 | -15 | -15 |
|  | Config 1 | dBm/ 15kHz | -92.1 | | | | | -92.1 | | | | |
| Time multiplexing of the downlink transmissions from each AoA | |  | Defined in Figure A.7.5.1.2.1-2 | | | | | | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | | | | | |

**Table A.7.5.1.2.1-4: Void**



**Figure A.7.5.1.2.1-1: SNR variation for in-sync testing**



Figure A.7.5.1.2.1-2: Time multiplexed downlink transmissions

##### A.7.5.1.2.2 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.7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

##### A.7.5.1.3.1 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 when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.7.5.1.3.1-1. The test parameters are given in Tables A.7.5.1.3.1-2, and A.7.5.1.3.1-3. 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.7.5.1.3.1-1 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. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.7.5.1.3.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Table A.7.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

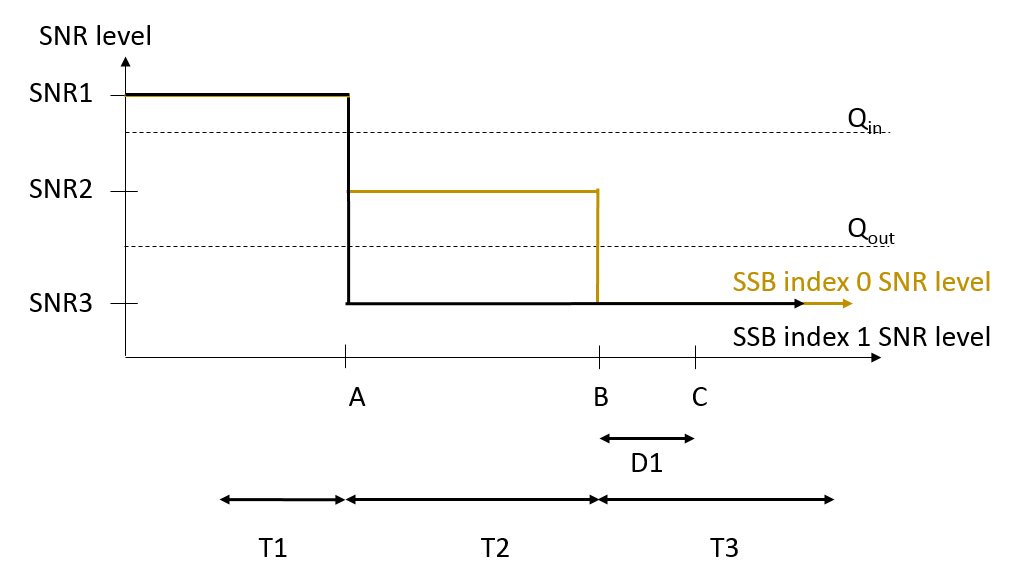
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 66 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.4 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 14.48 |
| T3 | | | s | 14.48 |
| D1 | | | s | 14.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

**Table A.7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | |
| **T1** | **T2** | **T3** |
| AoA setup | |  | Setup 1 defined in A.3.15 | | |
| Assumption for UE beams Note 5 | |  | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| ssb-Index 0 SNR | Config 1 | dB | 2Note 6 | -6Note 6 | -15 |
| ssb-Index 1 SNR | Config 1 | 2Note 6 | -15 | -15 |
|  | Config 1 | dBm/15KHz | -104.7dBm | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.  Note 5: Information about types of UE beams is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | |

**Table A.7.5.1.3.1-4: Void**

**Table A.7.5.1.3.1-5: Void**



**Figure A.7.5.1.3.1-1: SNR variation for out-of-sync testing**

##### A.7.5.1.3.2 Test Requirements

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

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

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

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

#### A.7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

##### A.7.5.1.4.1 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 when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables A.7.5.1.4.1-2, and A.7.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.4.1-1 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. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.7.5.1.4.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Table A.7.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode

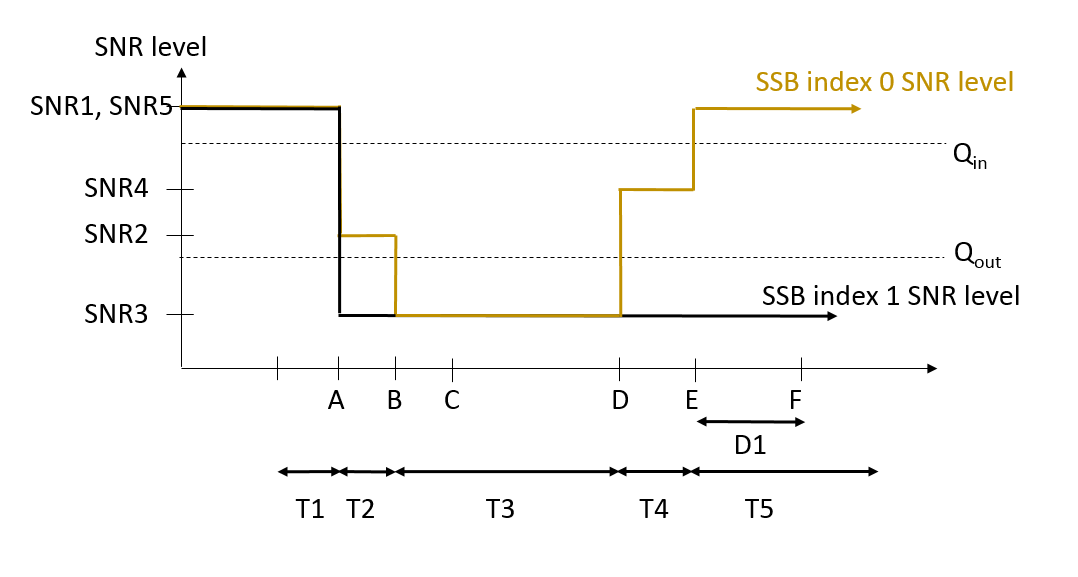
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| Duplex mode | | Config 1 |  | TDD |
| BWchannel | | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 66 |
| DL initial BWP configuration | | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR.3.1 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| PRACH Configuration | | Config 1 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1 |  | 0,1 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.11 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 2.8 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.88 |
| D1 | | | s | 3.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.7.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 5 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| ssb-Index 0 SNR | Config 1 | dB | 2Note 6 | -6Note 6 | -15 | -4.5 | 2Note 6 |
| ssb-Index 1 SNR | Config 1 | 2Note 6 | -15 | -15 | -15 | -15 |
|  | Config 1 | dBm/15KHz | -104.7dBm | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

**Table A.7.5.1.4.1-4: Void**

**Table A.7.5.1.4.1-5: Void**



**Figure A.7.5.1.4.1-1: SNR variation for in-sync testing**

##### A.7.5.1.4.2 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 (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.7.5.1.5 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

##### A.7.5.1.5.1 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 FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.5.1-1, A.7.5.1.5.1-2, A.7.5.1.5.1-3 and A.7.5.1.5.1-4 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.7.5.1.5.1-1 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 10 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. In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.7.5.1.5.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.5.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in non-DRX mode**

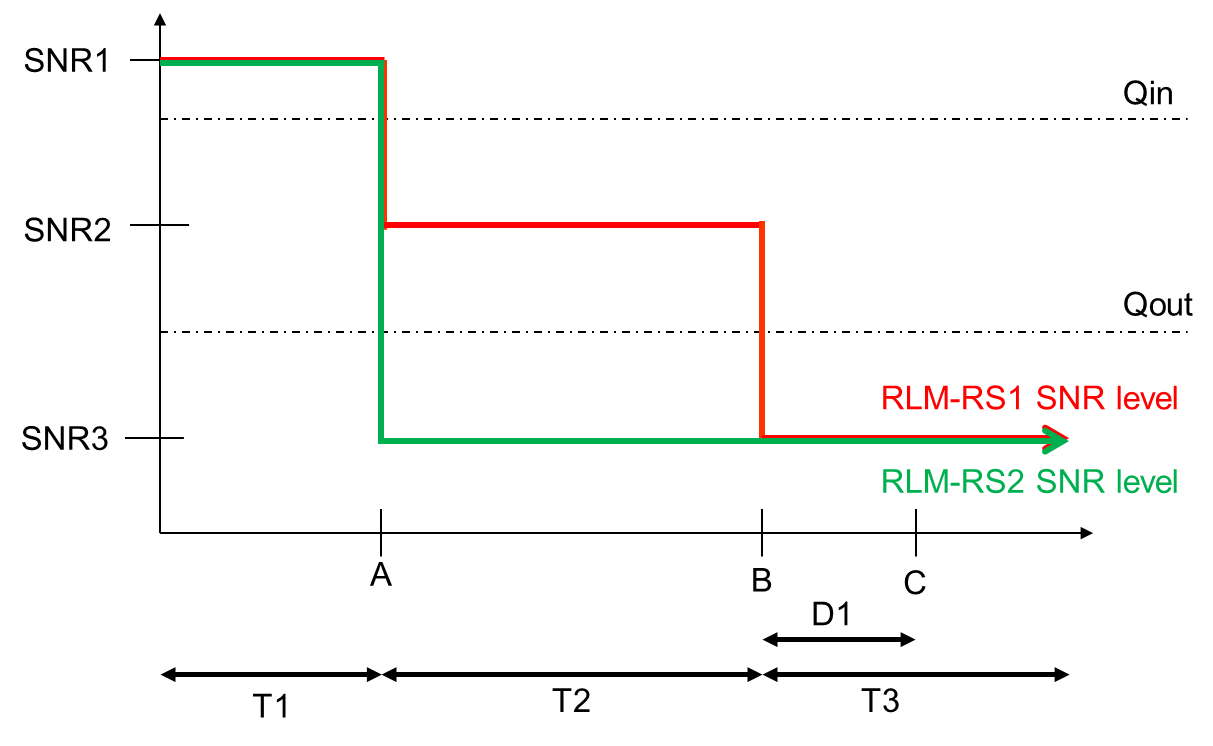
|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Duplex mode | Config 1 |  | TDD |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| BWchannel | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | Config 1 |  | 24 |
| BWoccupied | Config 1 |  | 24 |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.4 |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.4 TDD  CCR.3.6 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| OCNG parameters | |  | OP.5 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average 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 for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.35 |
| T3 | | s | 0.35 |
| D1 | | s | 0.31 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.7.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | |
| AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 10 | |  | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| 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-RS1 | Config 1 | dB | 2Note 11 | -6Note 11 | -15 |
| SNR on RLM-RS2 | Config 1 |  | Not sent | | | 2Note 11 | -14 | -15 |
|  | Config 1 | dBm/ 15kHz | -92.1 | | | -92.1 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.5.1-1.  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.  Note 10: Information about types of UE beams is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | | |

**Table A.7.5.1.5.1-4: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

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

****

**Figure A.7.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing**

##### A.7.5.1.5.2 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 second 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.7.5.1.6 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

##### A.7.5.1.6.1 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 FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.6.1-1, A.7.5.1.6.1-2 and A.7.5.1.6.1-3 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.7.5.1.6.1-1 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 10 ms. In the test, DRX configuration is not enabled. In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.7.5.1.6.1-1: Supported test configurations for FR2 PCell**

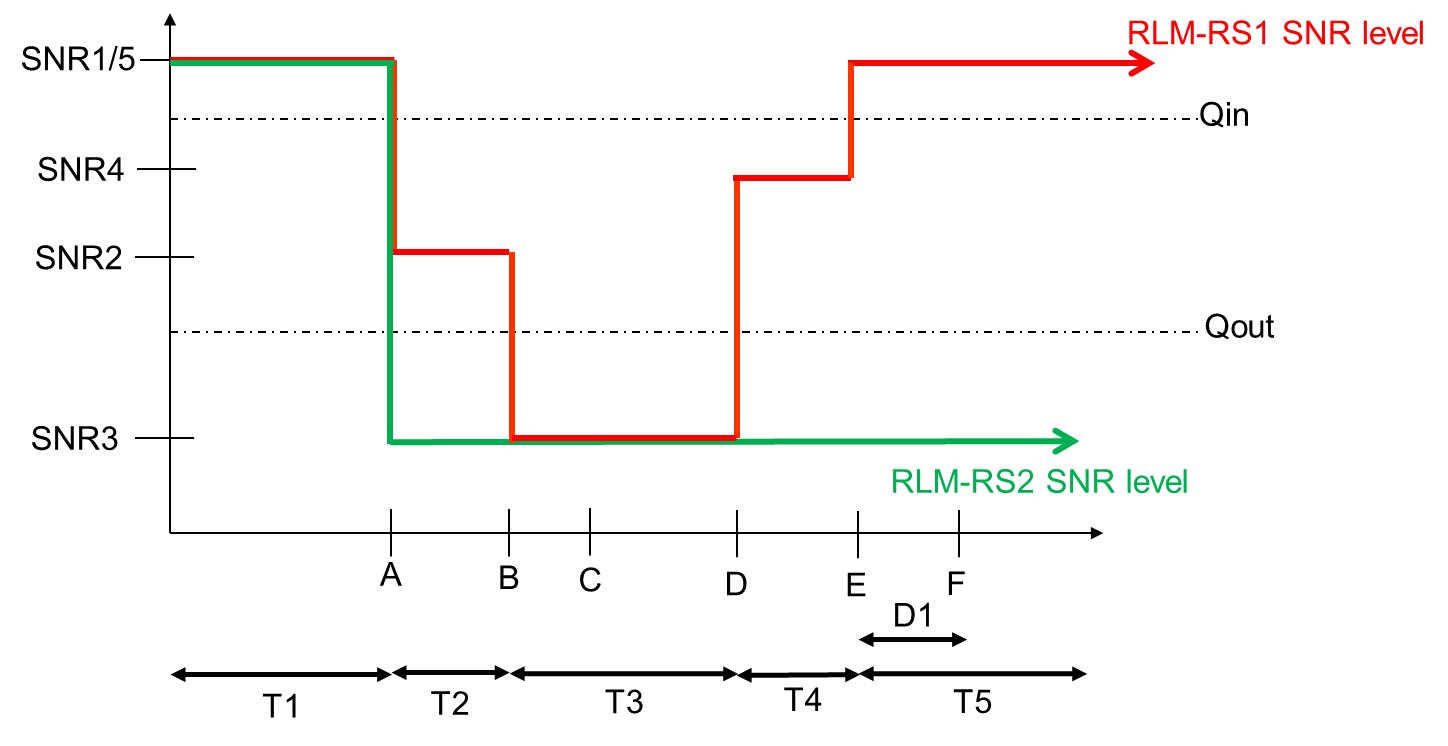
|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.6.1-2: General test parameters for FR2 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 |  | TDD |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| BWchannel | Config 1 |  | 100: NRB,c = 66 |
| Data RBs allocated | Config 1 |  | 24 |
| BWoccupied | Config 1 |  | 24 |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.4 |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.1 TDD  CCR.3.3 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| OCNG parameters | |  | OP.5 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average 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 for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.7.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | | | | | |
| AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| 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-RS1 | Config 1 | dB | 2Note 11 | -6Note 11 | -15 | -4.5 | 2Note 11 |
| SNR on RLM-RS2 | Config 1 |  | Not sent | | | | | 2Note 11 | -14 | -15 | -15 | -14 |
|  | Config 1 | dBm/ 15KHz | -92.1 | | | | | -92.1 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.6.1-1.  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.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | | | | | |

****

**Figure A.7.5.1.6.1-1: SNR variation for CSI-RS in-sync testing**

##### A.7.5.1.6.2 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 on the PCell.

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

#### A.7.5.1.7 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

##### A.7.5.1.7.1 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 DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.7.1-1, A.7.5.1.7.1-2, and A.7.5.1.7.1-3 below. There is one cell, cell 1 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.7.5.1.7.1-1 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 10 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.7.5.1.7.1-1: Supported test configurations for FR2 PCell**

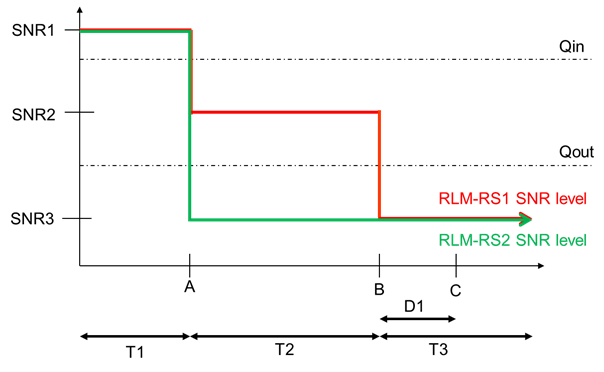
|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.7.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in DRX mode**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Duplex mode | Config 1 |  | TDD |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.4 TDD  CCR.3.6 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table A.7.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | |
| **T1** | **T2** | **T3** |
| AoA setup | | dB | Setup 1 defined in A.3.15 | | |
| Assumption for UE beams Note 10 | |  | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| 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-RS1 | Config 1 | dB | 2Note 11 | -6Note 11 | -15 |
| SNR on RLM-RS2 | Config 1 | dB | 2Note 11 | -14 | -15 |
|  | Config 1 | dBm/15KHz | -104.7 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.7.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in section A.3.6.1.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | |

****

**Figure A.7.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing**

##### A.7.5.1.7.2 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 (PCell) 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 (PCell) no later than time point C (D1 secondafter 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.7.5.1.8 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

##### A.7.5.1.8.1 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 DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.8.1-1, A.7.5.1.8.1-2, A.7.5.1.8.1-3 and A.7.5.1.8.1-4 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.7.5.1.8.1-1 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 10 ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.7.5.1.8.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.8.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode**

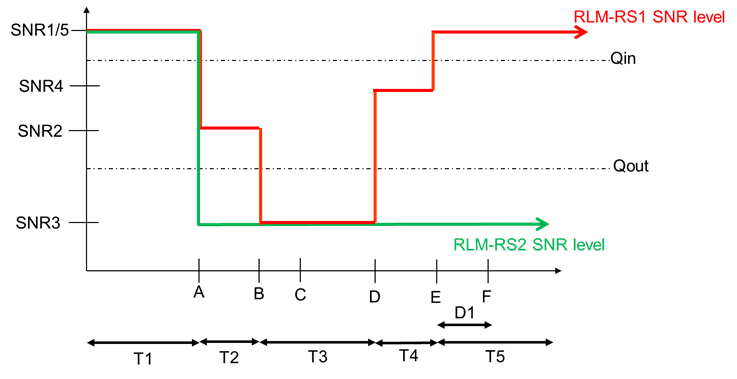
|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active PCell | |  | Cell 1 |
| RF Channel Number | |  | 1 |
| Duplex mode | Config 1 |  | TDD |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.1 TDD  CCR.3.3 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | \**gp0* |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *2000* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.64 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table A.7.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | | dB | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 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-RS1 | Config 1 | dB | 2Note 11 | -6Note 11 | -15 | -4.5 | 2Note 11 |
| SNR on RLM-RS2 | Config 1 | dB | 2Note 11 | -14 | -15 | -15 | -14 |
|  | Config 1 | dBm/15KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.8.1-1.  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.  Note 10: Information about types of UE beams is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | |

**Table A.7.5.1.8.1-4: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in non-DRX mode**

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

****

**Figure A.7.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

##### A.7.5.1.8.2 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 on the PCell.

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

#### A.7.5.1.9 UE Radio Link Monitoring Scheduling Restrictions on FR2

##### A.7.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly. The test case is only applicable to UE which supports pdcch-MonitoringAnyOccasions or pdcch-MonitoringAnyOccasionsWithSpanGap.

The test parameters are given in table A.7.5.1.9.1-1, table A.7.5.1.9.1-2 and table A.7.5.1.9.1-3 below. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

Table A.7.5.1.9.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.5.1.9.1-2: General test parameters for NR RLM scheduling restriction test case in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| RF Channel Number |  | 1 | 1 |  |
| SSB configuration |  | 1 | SSB.1 FR2 |  |
| SMTC configuration |  | 1 | SMTC pattern 1 |  |
| DRX cycle length | s | 1 | OFF |  |
| T1 | s | 1 | 5 | During T1 the UE is required to correctly transmit ACK/NACK |

Table A.7.5.1.9.1-3: Cell specific test parameters for NR RLM scheduling restriction test case in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | |
| AoA setup |  | 1 | Setup 3 defined in A.3.15.3 | |
| AoA1 | AoA2 |
| Assumption for UE beams Note 1 |  |  | Rough | Rough |
| TDD configuration |  | 1 | TDDConf.3.1 | |
| BWchannel | MHz | 1 | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1 | 24 | |
| PDSCH Reference measurement channel |  | 1 | SR.3.2 TDD | Not sent |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | Not sent |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.2 TDD | Not sent |
| TRS configuration |  | 1 | TRS.2.1 TDD | TRS.2.2 TDD |
| PDCCH/PDSCH TCI state |  | 1 | TCI.State.2 | N/A |
| OCNG Pattern |  | 1 | OP.5 defined in A.3.2.1 | Not sent |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | |
| RLM-RS |  | 1 | SSB with index 0 | SSB with index 1 |
|  | dBm/15kHz | 1 | -92.1 | -92.1 |
| Note2 | dBm/SCS | 1 | -83.1 | -83.1 |
|  | dB | 1 | 2 | 2 |
| BB Note 4 | dB | 1 | 1 | 1 |
| SSB\_RP Note3 | dBm/SCS | 1 | -81.1 | -81.1 |
| Io | dBm/95.04 MHz | 1 | -54.35 | -54.35 |
| Time multiplexing of the downlink transmissions from each AoA | | 1 | Defined in Figure A.7.5.1.9.1-1 | |
| Propagation Condition |  | 1 | AWGN | AWGN |
| Note 1: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | |



Figure A.7.5.1.9.1-1: Time multiplexed downlink transmissions

##### A.7.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

A.7.5.2 Interruption

#### A.7.5.2.1 Interruptions during measurements on deactivated NR SCC in FR2

A.7.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.7.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.7.5.2.1.1-2 and A.7.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, PCell is continuously scheduled in DL.

Table A.7.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode |

Table A.7.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | Two NR RF channels |
| Active PCell |  | Cell1 | PCell on NR RF channel number 1. |
| Configured deactivated SCell |  | Cell2 | Deactivated SCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell2 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.7.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell1** | **Cell2** |
| Frequency Range | |  | FR2 | |
| Duplex mode |  |  | TDD | |
| TDD configuration |  |  | TDDConf.3.1 | |
| BWchannel |  |  | 100 MHz: NRB,c = 66 | |
| Data RBs allocated |  |  | 66 | |
| Initial DL BWP Configuration |  |  | DLBWP.0.2Note4 | |
| Initial UL BWP Configuration |  |  | ULBWP.0.2 Note6 | |
| Downlink dedicated BWP Configuration |  |  | DLBWP.1.1 | |
| Uplink dedicated BWP configuration |  |  | ULBWP.1.1 | |
| PDSCH Reference measurement channel |  |  | SR.3.1 TDD | |
| RMSI CORESET parameters |  |  | CR.3.1 TDD | |
| Dedicated CORESET parameters |  |  | CCR.3.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SMTC Configuration | |  | SMTC.1 | |
| SSB Configuration |  |  | SSB.1 FR2 | |
| TCI State |  |  | TCI.State.0 | |
| TRS Configuration |  |  | TRS.2.1 TDD | |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Time offset to Cell1 Note 3 | | μs | - | 3 |
| Propagation Condition | |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of of TS 38.213 [3]. | | | | |

Table A.7.5.2.1.1-4: OTA related test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration | |  | Setup1 according to table A.3.15.1 | Setup 1according to table A.3.15.1 |
| Assumption for UE beams Note 6 | |  | Rough | Rough |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -104.7 | -104.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCS | -95.7 | -95.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| SS-RSRPNote2 | NR\_TDD\_FR2\_A | dBm/120KHz Note3 | -88.7 | -88.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
|  |  | dB | 7 | 7 |
|  | | dB | 7 | 7 |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -58.92 | -58.92 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beams is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | |

A.7.5.2.1.2 Test Requirements

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table A.7.5.2.1.2-1.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. The interruption on NR PCell shall not exceed the value defined in Table A.7.5.2.1.2-2.

Table A.7.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length**  **(slot)** |
| 3 | 0.125 | 4 |

Table A.7.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length**  **(slot)** |
| 3 | 0.125 | 8 + SMTC duration |

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

A.7.5.3 SCell Activation and Deactivation Delay

#### A.7.5.3.1 SCell Activation and deactivation for SCell in FR2 intra-band in non-DRX

##### A.7.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1 except the PCell and SCell are in FR2 intra-band.

The supported test configurations are shown in table A.7.5.3.1.1-1 below. The general test parameters are the same as defined in Table A.6.5.3.1.1-2 except those described in Tables A.7.5.3.1.1-2, and cell specific test parameters are described in Tables A.7.5.3.1.1-3. OTA related test parameters are shown in table A.7.5.3.1.1-4 below.

Table A.7.5.3.1.1-1: Supported test configurations for FR2 SCell activation case

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Table A.7.5.3.1.1-2: General test parameters for FR2 SCell activation case

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1,2 | Two NR radio channels are used for this test, cell 1 and cell2 use RF channel 1 and 2, respectively. |

**Table A.7.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ParameterNote 5** | **Unit** | **Cell 1** | | | **Cell 2** | | | |
| **T1** | **T2** | **T3** | **T1** | | **T2** | **T3** |
| SSB ARFCN |  | freq1 | | | freq2 | | | |
| Duplex mode |  | TDD | | | | | | |
| TDD configuration |  | TDDConf.3.1 | | | | | | |
| Downlink initial BWP Configuration |  | DLBWP.0.1 | | | | | | |
| Downlink dedicated BWP Configuration |  | DLBWP.1.1 | | | | | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | | | | | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | | | | | |
| TRS configuration |  | TRS.2.1 TDD | | | | | | |
| TCI state |  | TCI.State.0 | | | | | | |
| BWchannel | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated |  | 66 | | | 66 | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | | | - | | | |
| RMSI CORESET Parameters |  | CR.3.1 TDD | | | - | | | |
| Dedicated CORESET Parameters |  | CCR.3.1 TDD | | | - | | | |
| OCNG Patterns |  | OP.1 | | | | | | |
| SSB Configuration |  | SSB.1 FR2 | | | | | | |
| SMTC Configuration |  | SMTC.1 | | | | | | |
| CSI-RS configuration for CSI reporting |  | CSI-RS.3.1 TDD | | | | | | |
| reportConfigType |  | periodic | | | | N/A | | |
| reportQuantity |  | cri-RI-PMI-CQI | | | | N/A | | |
| CSI reporting periodicity | slot | 40 | | | | N/A | | |
| CSI reporting offset | slot | 4 | | | | N/A | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | | | | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | AWGN | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: Void | | | | | | | | |

Table A.7.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Angle of arrival configuration |  | Setup 1 according to table A.3.15.1 | | | Setup 1 according to table A.3.15.1 | | |
| Assumption for UE beams Note 7 |  | Rough | | | Rough | | |
| Note1 | dBm/15kHzNote4 | -104.7 | | | -104.7 | | |
| Note1 | dBm/SCSNote3 | -95.7 | | | -95.7 | | |
|  | dB | 7 | | | 7 | | |
| SSB\_RPNote2 | dBm/SCS Note4 | -88.7 | | | -88.7 | | |
|  | dB | 7 | | | 7 | | |
| IoNote2 | dBm/95.04 MHz Note4 | -58.92 | | | -58.92 | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Void  Note 7: Implementation about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | |

##### A.7.5.3.1.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except Tactivation\_time will be replaced with the value TFirstSSB + 5ms as defined in clause 8.3.

#### A.7.5.3.2 SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2

##### A.7.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.7.5.3.1.1 except the PCell is in FR1 and SCell is in FR2.

The supported test configurations are defined in Table A.7.5.3.2.1-1. The general test parameters are the same as defined in Table A.6.5.3.1.1-2 except that the length of T2 is 2s. And cell specific test parameters are described in Tables A.7.5.3.2.1-2. OTA related test parameters are defined in Table A.7.5.3.2.1-3.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2.

During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot m+TL1-RSRP. In the next DL slot after slot m+TL1-RSRP, the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell and PCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

**Table A.7.5.3.2.1-1: Supported test configurations for FR2 SCell activation case**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode  Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode  Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

**Table A.7.5.3.2.1-2: Cell specific test parameters for FR2 SCell activation case**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ParameterNote 5 | | Unit | Cell 1 | | | | Cell 2 | | |
| T1 | T2 | T3 | | T1 | T2 | T3 |
| SSB ARFCN | |  | Freq1 | | | | Freq2 | | |
| Duplex mode | Config 1 |  | FDD | | | | TDD | | |
| Config 2,3 |  | TDD | | | | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | | TDDConf.3.1 | | |
| Config 2 | TDDConf.1.1 | | | |
| Config 3 | TDDConf.2.1 | | | |
| Downlink initial BWP Configuration | Config 1,2,3 |  | DLBWP.0.1 | | | | | | |
| Downlink dedicated BWP Configuration | Config 1,2,3 |  | DLBWP.1.1 | | | | | | |
| Uplink initial BWP configuration | Config 1,2,3 |  | ULBWP.0.1 | | | | | | |
| Uplink dedicated BWP configuration | Config 1,2,3 |  | ULBWP.1.1 | | | | | | |
| TRS configuration | Config 1,2,3 |  | N/A | | | | TRS.2.1 TDD | | |
| TCI state | Config 1,2,3 |  | TCI.State.0 | | | | | | |
| BWchannel | Config 1,2 | MHz | 10: NRB,c = 52 | | | | 100: NRB,c = 66 | | |
| Config 3 | 40: NRB,c = 106 | | | |
| Data RBs allocated | Config 1,2 |  | 52 | 66 | 52 | | 66 | 52 | 66 |
|  | Config 3 |  | 106 |  | 106 | |  | 106 |  |
| 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.1.1 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 | | | | SSB.3 FR2 | | |
| Config 3 | SSB.2 FR1 | | | |
| CSI-RS configuration for CSI reporting | Config 1~3 |  | N/A | | | | N/A | CSI-RS.3.1 TDD Note 6 | CSI-RS.3.1 TDD |
| reportConfigType for CSI reporting |  |  | periodic | | | | N/A | | |
| reportConfigType for L1-RSRP |  |  | periodic | | | | N/A | | |
| reportQuantity for CSI reporting |  |  | cri-RI-PMI-CQI | | | | N/A | | |
| reportQuantity for L1-RSRP |  |  | ssb-Index-RSRP | | | | N/A | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | | | N/A | | |
| Config 3 | 10 | | | |
| L1-RSRP reporting periodicity Note 7 | Config 1,2 | slot | 5 | | | | N/A | | |
| Config 3 | 10 | | | |
| CSI reporting offset | Config 1,2 | slot | 2 | | | | N/A | | |
| Config 3 | 4 | | | |
| L1-RSRP reporting offset | Config 1,2 | slot | 2 | | | | N/A | | |
| Config 3 | 4 | | | |
| SMTC configuration | |  | SMTC.1 | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | | |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Propagation conditions | |  | N/A  Link only, see clause A.3.7A | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: All parameters apply for configuration 1 and 2.  Note 6: CSI-RS for CSI measurement is (re)configured in the next DL slot after slot m+TL1-RSRP during T2.  Note 7: L1-RSRP measurement and reporting are configured to the the UE prior to the start of time period T1. | | | | | | | | | |

Table A.7.5.3.2.1-3: OTA related test parameters for FR1 PCell activation case with FR2 SCell

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | Cell 1 | | | Cell 2 | | | | |
| T1 | T2 | T3 | T1 | T2 | | T3 | |
| Angle of arrival configuration | |  | N/A | | | According to clause A.3.15.1 | | | | |
| Assumption for UE beams Note 7 | |  | N/A | | | Rough | | | | |
| Note 1 | Config 1,2,3 | dBm/15kHz | Link only, see clause A.3.7A | | | -104.7 | | | | |
| Note 1 | Config 1,2,3 | dBm/SCS | -95.7 | | | | |
|  | Config 1,2,3 | dB | -∞ | | 7 | | 7 |
|  | Config 1,2,3 | dB | -∞ | | 7 | | 7 |
| SSB\_RPNote 2, Note 4 | Config 1,2,3 | dBm/SCS | -∞ | | -88.7 | | -88.7 |
| IoNote 2, Note 4 | Config 1,2,3 | dBm/95.04 MHz | -66.68 | | -58.92 | | -58.92 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Void  Note 7: Information about types of UE beam is given in B.2.1.3 and does not imit UE implementation or test system implementation. | | | | | | | | | | |

##### A.7.5.3.2.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2 the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+TL1-RSRP), where TL1-RSRP is no larger than

3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report

as defined in clause 8.3.2. For this test case, TFirstSSB\_MAX=TSMTC\_MAX=Trs=20ms; TL1-RSRP, measure=160ms and TL1-RSRP, report=5ms, which allows TL1-RSRP 680 ms.

During T2 the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot , where

- THARQ is defined in Table A.5.5.3.1.1-2

- Tactivation\_time = 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}, which allows 710 ms

- TCSI\_Reporting = 10ms

- NR slot length is 0.125ms for this test case.

During T3 the UE shall stop sending CSI reports for both SCells no later than slot , as defined in clause 8.3.

During T2 interruption of PCell during SCell activation shall not happen outside the slot to , as defined in clause 8.3, where TX =20ms.

During T3 the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot to , as defined in clause 8.3.

The interruption of PCell due to activation of SCell shall not be more than the values specified for SA in Clause 8.2.2.2.7.

A.7.5.4 Void

A.7.5.5 Beam Failure Detection and Link recovery procedures

#### A.7.5.5.1 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.7.5.5.1.1 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 FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.1.1-1, A.7.5.5.1.1-2, A.7.5.5.1.1-3 and A.7.5.5.1.1-4 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.7.5.5.1.1-1 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.7.5.5.1.1-1 additionally 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.

Table A.7.5.5.1.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

**Table A.7.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1-2 |  | Cell 1 |  |
| RF Channel Number | | 1-2 |  | 1 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 |  |
| BWchannel | | 1-2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD |  |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 |  |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.1 FR2 |  |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.3 |  |
| PRACH Configuration | | 1-2 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | | 1-2 |  | OFF |  |
| SSB index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| SSB index assigned as RLM RS | | 1-2 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | gp0 |  |
| gapOffset | | 1-2 | ms | 0 |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 2 | -92 |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 2.61 |  |
| T3 | | 1-2 | s | 1.64 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 1.01 |  |
| D1 | | 1-2 | s | 0.97 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.7.5.5.1.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1-2 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1 | dBm/ | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 2 | SCS | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1,2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

**Table A.7.5.5.1.1-4: Void**

****

**Figure A.7.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.7.5.5.1.2 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 = 960+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

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

#### A.7.5.5.2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode

##### A.7.5.5.2.1 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 DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.2.1-1, A.7.5.5.2.1-2, A.7.5.5.2.1-3, A.7.5.5.2.1-4 and A.7.5.5.2.1-5 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.7.5.5.2.1-1 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.7.5.5.2.1-1 additionally 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 enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.7.5.5.2.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

**Table A.7.5.5.2.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1-2 |  | Cell 1 |  |
| RF Channel Number | | 1-2 |  | 1 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 |  |
| BWchannel | | 1-2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD |  |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 |  |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.1 FR2 |  |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.3 |  |
| PRACH Configuration | | 1-2 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | | 1-2 |  | DRX.3 | A.3.3.3 |
| SSB index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| SSB index assigned as RLM RS | | 1-2 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 2 | -92 |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 3.37 |  |
| T3 | | 1-2 | s | 2.8 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 0.61 |  |
| D1 | | 1-2 | s | 0.57 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.7.5.5.2.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1,2 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 2 |  | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | |

**Table A.7.5.5.2.1-4: Void**

**Table A.7.5.5.2.1-5: Void**

****

**Figure A.7.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.7.5.5.2.2 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 UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 560+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

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

#### A.7.5.5.3 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.7.5.5.3.1 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 FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.3.1-1, A.7.5.5.3.1-2, and A.7.5.5.3.1-3 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.7.5.5.3.1-1 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.7.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery. 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.

**Table A.7.5.5.3.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.5.3.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1 |  | Cell 1 |  |
| RF Channel Number | | 1 |  | 1 |  |
| Duplex mode | | 1 |  | TDD |  |
| TDD Configuration | | 1 |  | TDDConf.3.1 |  |
| BWchannel | | 1 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 |  |
| DL initial BWP configuration | | 1 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| OCNG parameters | | 1 |  | OP.1 |  |
| CP length | | 1 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.1 FR2 |  |
| SMTC Configuration | | 1 |  | SMTC.3 |  |
| PRACH Configuration | | 1 |  | FR2 PRACH configuration 4 | A.3.8.3.4 |
| DRX configuration | | 1 |  | OFF |  |
| CSI-RS configuration for BFD/CBD/RLM | | 1 |  | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS index assigned as BFD RS (q0) | | 1 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1 |  | 1 |  |
| CSI-RS index assigned as RLM RS | | 1 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1 |  | 1-0 |  |
| Number of Control OFDM symbols | 1 |  | 2 |  |
| Aggregation level | 1 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 |  |
| DMRS precoder granularity | 1 |  | REG bundle size |  |
| REG bundle size | 1 |  | 6 |  |
| Gap pattern ID | | 1 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 |  | CSI-RS.3.1 TDD | A.3.14.2 |
| reportConfigType | | 1 |  | periodic |  |
| reportQuantity | | 1 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1 | slot | 40 |  |
| CSI reporting offset | | 1 | slot | 4 |  |
| T310 | | 1 | ms | 1000 |  |
| N310 | | 1 |  | 2 |  |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 1.17 |  |
| T3 | | 1 | s | 0.9 |  |
| T4 | | 1 | s | 0 |  |
| T5 | | 1 | s | 0.31 |  |
| D1 | | 1 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.7.5.5.3.1-3: Cell specific test parameters for FR2 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 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.3.1-1.  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 modified as specified in clause A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | |

Table A.7.5.5.3.1-4: Void

Table A.7.5.5.3.1-5: Void

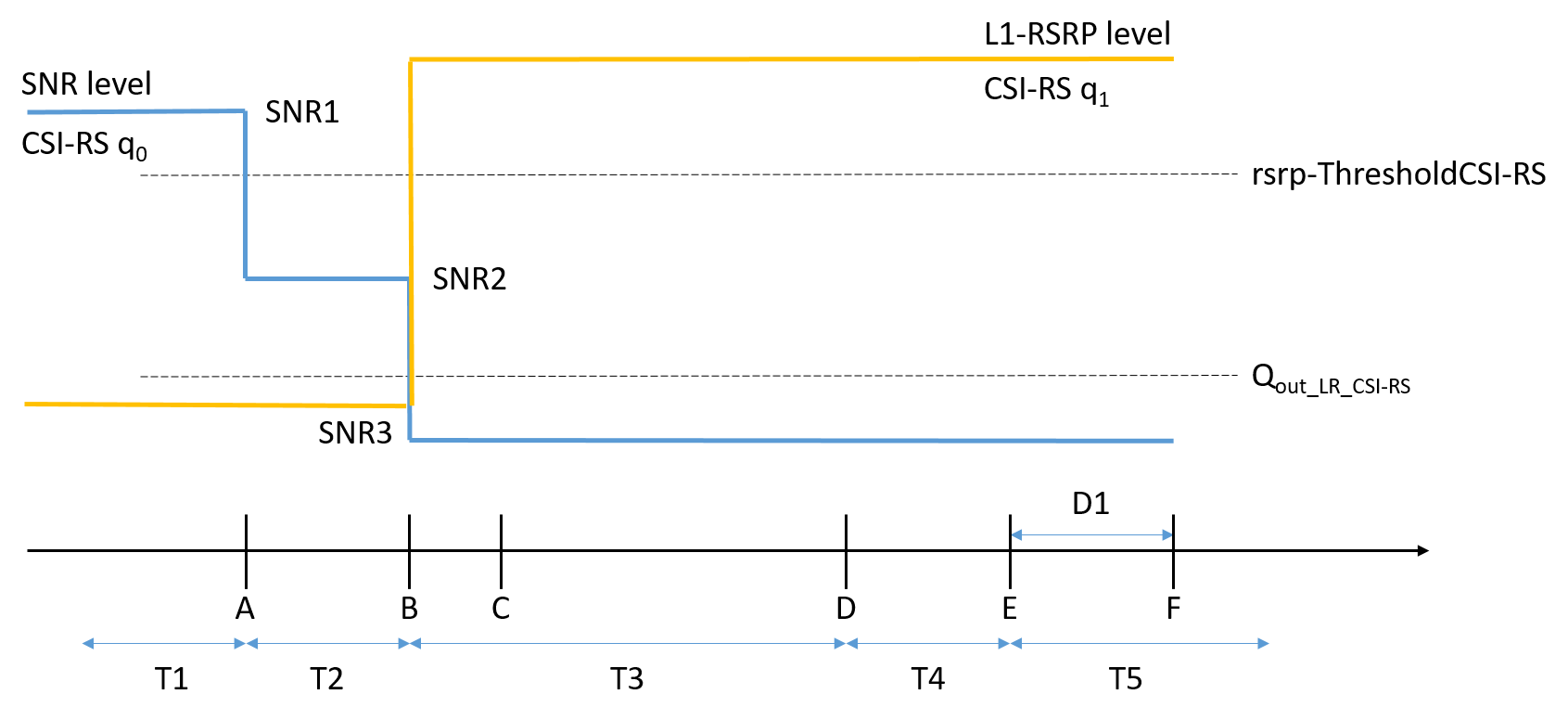


Figure A.7.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

##### A.7.5.5.3.2 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 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

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

#### A.7.5.5.4 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode

##### A.7.5.5.4.1 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 DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.4.1-1, A.7.5.5.4.1-2, A.7.5.5.4.1-3, and A.7.5.5.4.1-4 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.7.5.5.4.1-1 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.7.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.7.5.5.4.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.5.4.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1 |  | Cell 1 |  |
| RF Channel Number | | 1 |  | 1 |  |
| Duplex mode | | 1 |  | TDD |  |
| TDD Configuration | | 1 |  | TDDConf.3.1 |  |
| BWchannel | | 1 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 |  |
| DL initial BWP configuration | | 1 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| OCNG parameters | | 1 |  | OP.1 |  |
| CP length | | 1 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.1 FR2 |  |
| SMTC Configuration | | 1 |  | SMTC.3 |  |
| PRACH Configuration | | 1 |  | FR2 PRACH configuration 4 | A.3.8.3.4 |
| DRX configuration | | 1 |  | DRX.3 | A.3.3.3 |
| CSI-RS configuration for BFD/CBD/RLM | | 1 |  | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS index assigned as BFD RS (q0) | | 1 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1 |  | 1 |  |
| CSI-RS index assigned as RLM RS | | 1 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1 |  | 1-0 |  |
| Number of Control OFDM symbols | 1 |  | 2 |  |
| Aggregation level | 1 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 |  |
| DMRS precoder granularity | 1 |  | REG bundle size |  |
| REG bundle size | 1 |  | 6 |  |
| Gap pattern ID | | 1 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 |  | CSI-RS.3.1 TDD | A.3.14.2 |
| reportConfigType | | 1 |  | periodic |  |
| reportQuantity | | 1 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1 | slot | 40 |  |
| CSI reporting offset | | 1 | slot | 4 |  |
| T310 | | 1 | ms | 1000 |  |
| N310 | | 1 |  | 2 |  |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 5.43 |  |
| T3 | | 1 | s | 5.16 |  |
| T4 | | 1 | s | 0 |  |
| T5 | | 1 | s | 0.31 |  |
| D1 | | 1 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.7.5.5.4.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.4.1-1.  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 modified as specified in clause A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | |

Table A.7.5.5.4.1-4: Void

Table A.7.5.5.4.1-5: Void

Table A.7.5.5.4.1-6: Void

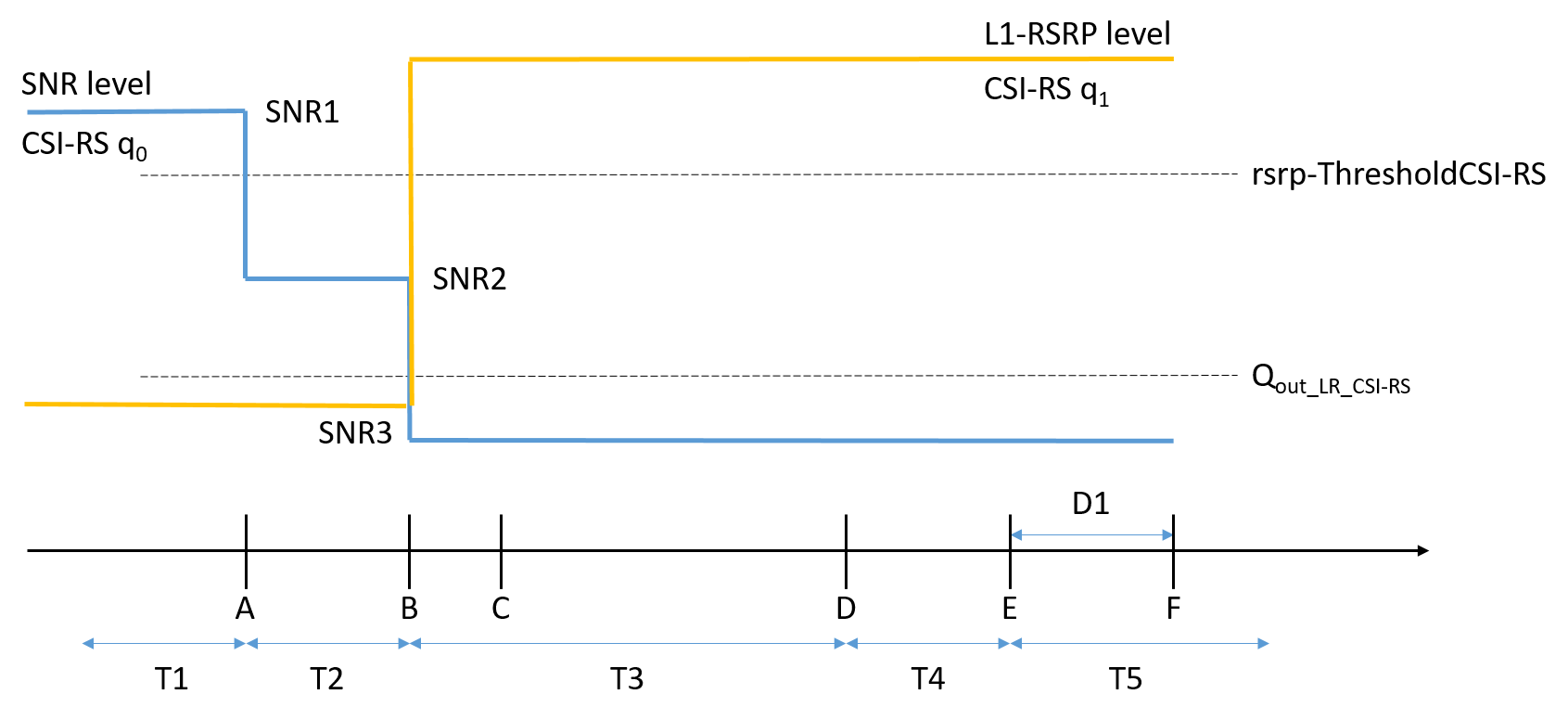


Figure A.7.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

##### A.7.5.5.4.2 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 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 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

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

#### A.7.5.5.5 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.7.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.7.5.5.5.1-1, A.7.5.5.5.1-2 and A.7.5.5.5.1-3 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.7.5.5.5.1-1 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.7.5.5.5.1-1 additionally 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 5ms. This test will focus on the scheduling availability during beam failure detection) and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

**Table A.7.5.5.5.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.7.5.5.5.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active PCell | | 1-2 |  | Cell 1 |  |
| RF Channel Number | | 1-2 |  | 1 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 |  |
| BWchannel | | 1-2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1 |  | SR.3.2 TDD |  |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1 |  | CR.3.1 TDD |  |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.3.1 TDD |  |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 |  |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1 |  | SSB.1 FR2 |  |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.1 |  |
| PRACH Configuration | | 1-2 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | | 1-2 |  | OFF |  |
| SSB index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 2 | -92 |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 2.6 |  |
| T3 | | 1-2 | s | 1.64 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 1.01 |  |
| D1 | | 1-2 | s | 0.97 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.7.5.5.5.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA Setup | |  | Setup1 defined in A.3.15.1 | | | | |
| Assumption for UE beams Note 10 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR\_SSB of set q0 | Config 1-2 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| Config 2 | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-2 | dBm/120 kHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.5.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.  Note 10: Information about types of UE beam given in B.2.1.3 and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband. | | | | | | | |

****

Figure A.7.5.5.5.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.7.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

A.7.5.6 Active BWP switch

#### A.7.5.6.1 DCI-based and Timer-based Active BWP Switch

##### A.7.5.6.1.1 NR FR2- NR FR2 DL active BWP switch of SCell with non-DRX in SA

A.7.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.1.1-1 below. The test scenario comprises of one PCell (Cell 1) and one SCell (Cell 2) as given in Table A.7.5.6.1.1.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.1.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.1.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

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

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

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

UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 1 before starting the test.

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

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-0 in PCell.

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

All cells have 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 SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell’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 no later than the first DL slot that occurs after the beginning of SCell’s DL slot (*i+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell no later than the first UL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-2 no later than the first DL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay).

The starting time of PCell (Cell 1) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on SCell (Cell 2).

During T3,

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

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell’s DL slot (*j+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell at latest on the first UL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-1 no later than the first DL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay).

The starting time of PCell (Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

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

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

**Table A.7.5.6.1.1.1-1: DL BWP switch supported test configurations**

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode |

**Table A.7.5.6.1.1.1-2: General test parameters for DL BWP switch in SA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| NR RF Channel Number |  | 1, 2 | Two NR radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active SCell |  | Cell 2 | SCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and SCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

**Table A.7.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell2** |
| Frequency Range |  | FR2 | FR2 |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel |  | 100 MHz: NRB,c = 66 | |
| Active BWP ID |  | 0 | 1, 2 |
| Downlink initial BWP Configuration |  | DLBWP.0.2 | |
| Uplink initial BWP Configuration |  | ULBWP.0.2 | N.A. |
| Downlink active BWP-0 Configuration |  | DLBWP.0.2 | - |
| Downlink active BWP-1 Configuration |  | N.A. | DLBWP.1.1 |
| Downlink active BWP-2 Configuration |  | N.A. | DLBWP.1.3 |
| Uplink active BWP-0 Configuration |  | ULBWP.0.2 | N.A. |
| Uplink active BWP-1 Configuration |  | N.A. | N.A. |
| Uplink active BWP-2 Configuration |  | N.A. | N.A. |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | |
| TRS configuration |  | TRS.2.1 TDD | |
| TCI state |  | TCI.State.0 | |
| RMSI CORESET parameters |  | CR.3.1 TDD | |
| Dedicated CORESET parameters |  | CCR.3.1 TDD | |
| OCNG Patterns |  | OP.1 | |
| SSB Configuration |  | SSB.1 FR2 | |
| SMTC Configuration |  | SMTC.1 | |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |
| Propagation Condition |  | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table A.7.5.6.1.1.1-4: OTA related test parameters for BWP switching test case**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 defined in clause A.3.15.1 | |
| Assumption for UE beams Note 6 |  | Fine | Fine |
| Note1 | dBm/15kHz | -112 | -112 |
| Note1 | dBm/SCS | -103 | -103 |
| SS-RSRPNote2 | dBm/SCS Note3 | -85 | -85 |
|  | dB | 18 | 18 |
| IoNote4 | dBm/95.04 MHz Note4 | -56 | -56 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | |

A.7.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell on 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 SCell on 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 SCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

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

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the first UL slot that occurs after the 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.

##### A.7.5.6.1.2 NR FR1- NR FR2 DL active BWP switch of SCell with non-DRX in SA

A.7.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.2.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). The general parameters are given in Table A.7.5.6.1.2.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.2.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

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

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

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

UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.

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

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in PCell.

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

All cells have 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 SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell’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 no later than the first DL slot that occurs after the beginning of SCell’s DL slot (*i+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell no later than the first UL slot that occurs after the begining of slot (*i+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-2 no later than the first DL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay).

The starting time of PCell (Cell 1) interruption due to BWP switch on SCell shall occur within the BWP switch delay if the UE doesn’t support per-FR gap, otherwise no interruption due to BWP switch on PCell is allowed.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on SCell (Cell 2).

During T3,

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

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell’s DL slot (*j+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell at latest on the first UL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-1 no later than the first DL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay).

The starting time of PCell (Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay if the UE doesn’t support per-FR gap, otherwise no interruption due to BWP switch on PCell is allowed.

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

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

**Table A.7.5.6.1.2.1-1: DL BWP switch supported test configurations**

|  |  |
| --- | --- |
| Config | Description |
| 1 | PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | PCell: NR 30 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

**Table A.7.5.6.1.2.1-2: General test parameters for DL BWP switch in SA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| NR RF Channel Number |  | 2 | Two NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active SCell |  | Cell 2 | SCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and SCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on SCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

**Table A.7.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell2** |
| Frequency Range | |  | FR1 | FR2 |
| Duplex mode | Config 1 |  | FDD | TDD |
|  | Config 2,3 |  | TDD |  |
| TDD configuration | Config 1 |  | Not Applicable | TDDConf.3.1 |
|  | Config 2 |  | TDDConf.1.1 |  |
|  | Config 3 |  | TDDConf.2.1 |  |
| BWchannel | Config 1,2 | MHz | 10 MHz: NRB,c = 52 | 100 MHz: NRB,c = 66 |
|  | Config 3 |  | 40 MHz: NRB,c = 106 |  |
| Active BWP ID | |  | 0 | 1, 2 |
| Downlink initial BWP Configuration | |  | DLBWP.0.2 | |
| Uplink initial BWP Configuration | |  | ULBWP.0.2 | N.A. |
| Downlink active BWP-0 Configuration | |  | DLBWP.0.2 | - |
| Downlink active BWP-1 Configuration | |  | - | DLBWP.1.1 |
| Downlink active BWP-2 Configuration | |  | - | DLBWP.1.3 |
| Uplink active BWP-0 Configuration | |  | ULBWP.0.2 | - |
| Uplink active BWP-1 Configuration | |  | - | N.A. |
| Uplink active BWP-2 Configuration | |  | - | N.A. |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD | SR.3.1 TDD |
| measurement | Config 2 |  | SR.1.1 TDD |  |
| channel | Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET | Config 1 |  | CR.1.1 FDD | CR.3.1 TDD |
| parameters | Config 2 |  | CR.1.1 TDD |  |
|  | Config 3 |  | CR.2.1 TDD |  |
| Dedicated | Config 1 |  | CCR.1.1 FDD | CCR.3.1 TDD |
| CORESET | Config 2 |  | CCR.1.1 TDD |  |
| parameters | Config 3 |  | CCR.2.1 TDD |  |
| OCNG Patterns | |  | OP.1 | |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 | SSB.1 FR2 |
|  | Config 3 |  | SSB.2 FR1 |  |
| TRS configuration | Config 1,2,3 |  | - | TRS.2.1 TDD |
| TCI state | Config 1,2,3 |  | TCI.State.0 | TCI.State.0 |
| SMTC Configuration | |  | SMTC.1 | |
| Correlation Matrix and Antenna Configuration | |  | NA  Link only, see clause A.3.7A | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  |
| Propagation Condition | |  | NA  Link only, see clause A.3.7A | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table A.7.5.6.1.2.1-4: OTA related test parameters for BWP switching test case**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | NA  Link only, see clause A.3.7A | Setup 1 defined in clause A.3.15.1 |
| Assumption for UE beams Note 6 |  | Fine |
| Note1 | dBm/15kHz | -112 |
| Note1 | dBm/SCS | -103 |
| SS-RSRPNote2 | dBm/SCS Note3 | -85 |
|  | dB | 18 |
| IoNote4 | dBm/95.04 MHz Note4 | -56 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | |

A.7.5.6.1.2.2 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 PCell active BWP switch delay to be counted as correct.

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

If the UE doesn’t support per-FR gap,

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

Otherwise no interruption due to BWP switch on SCell is allowed.

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

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

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

##### A.7.5.6.1.3 NR FR2 DL active BWP switch with non-DRX in SA

###### A.7.5.6.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.7.5.6.1.3.1-1.

The test scenario comprises of one cell (Cell 1) as given in Table A.7.5.6.1.3.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.6.1.3.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.6.1.3.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (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.

All cells have 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 Cell 1’s slot # denoted *i*. The UE should 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 Cell 1’s DL slot (*i+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 no later than the first UL slot that occurs after the beginning of slot (*i+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on Cell 1’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 Cell 1.

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the half subframe immediately after *bwp-InactivityTimer* timer expires. The UE should 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 Cell 1’s DL slot (*j+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 at latest on the first UL slot that occurs after the beginning of slot (*j+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on Cell 1’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 is received.

Table A.7.5.6.1.3.1-1: DL BWP switch supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void.  Note 2: A UE which fulfils the requirements in test case A.7.5.6.1.1 or A.7.5.6.1.2 can skip the test cases in A.7.5.6.1.3. | |

Table A.7.5.6.1.3.1-2: 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 | Cell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

Table A.7.5.6.1.3.1-3: NR Cell specific test parameters for DL BWP switch in SA

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Active BWP ID |  | 1, 2 |
| Initial DL BWP Configuration |  | DLBWP.0.2 Note 2 |
| Active DL BWP-1 Configuration |  | DLBWP.1.1 Note 2 |
| Active DL BWP-2 Configuration |  | DLBWP.1.3 Note 2 |
| Initial UL BWP Configuration |  | ULBWP.0.2 Note 2 |
| Active UL BWP-1 Configuration |  | ULBWP.1.1 Note 2 |
| Active UL BWP-2 Configuration |  | ULBWP.1.3 Note 2 |
| PDSCH Reference measurement channel |  | SR.3.1 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.1 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State |  | TCI.State.0 |
| TRS Configuration |  | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | |

Table A.7.5.6.1.3.1-4: OTA related test parameters for DL BWP switch in SA

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 2 |
| Angle of arrival configuration |  | Setup 1 defined in clause A.3.15.1 |
| Assumption for UE beams Note 6 |  | Fine |
| NocNote 1 | dBm/15 kHz | -112 |
| NocNote 1 | dBm/SCS | -103 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 |
| Ês/Iot | dB | 18 |
| Ês/Noc Note 5 | dB | 18 |
| IoNote2 | dBm/95.04 MHz Note4 | -56 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | |

###### A.7.5.6.1.3.2 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 PCell active BWP switch delay to be counted as correct.

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

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

#### A.7.5.6.2 RRC-based Active BWP Switch

A.7.5.6.2.1 NR FR2 DL active BWP switch of PCell with non-DRX in SA

A.7.5.6.2.1.1 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 8.6.3. Supported test configurations are shown in Table A.7.5.6.2.1.1-1.

The test scenario comprises of one PCell (Cell 1) as given in Table A.7.5.6.2.1.1-2. Cell-specific parameters of PCell are specified in Table A.7.5.6.2.1.1-3 below.

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

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- 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.

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 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 completely 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. The UE shall be continuously scheduled on PCell’s BWP-1 starting from the first DL slot that occurs after the beginning of DL slot .

*TRRCprocessingDelay* and *TBWPswitchDelayRRC* are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configurationis sent till the time when RRC Reconfiguration Complete message is received.

Table A.7.5.6.2.1.1-1: DL BWP switch supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.5.6.2.1.1-2: 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 PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| T1 | s | 0.2 |  |

Table A.7.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** |
| Frequency Range | |  | FR2 |
| Duplex mode | |  | TDD |
| TDD configuration | |  | TDDConf.3.1 |
| BWchannel | |  | 100 MHz: NRB,c = 66 |
| Active BWP ID | |  | 1 |
| Initial DL BWP Configuration | |  | DLBWP.0.2 |
| Initial UL BWP Configuration | |  | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration |  | DLBWP.1.3 |
|  | Active UL BWP-1 Configuration |  | ULBWP.1.3 |
| Final  Condition | Active DL BWP-1 Configuration |  | DLBWP.1.1 |
|  | Active UL BWP-1 Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD |
| RMSI CORESET parameters | |  | CR.3.1 TDD |
| Dedicated CORESET parameters | |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | |  | SSB.1 FR2 |
| SMTC Configuration | |  | SMTC.1 |
| TCI State | |  | TCI.State.0 |
| TRS Configuration | |  | TRS.2.1 TDD |
| Antenna Configuration | |  | 1x2 |
| Propagation Condition | |  | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| Note 1: OCNG shall be used such that 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]. | | | |

Table A.7.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 |
| Angle of arrival configuration | |  | Setup 1 according to table A.3.15 |
| Assumption for UE beams Note 5 | |  | Fine |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -112 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCS | -103 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| SS-RSRPNote2 | NR\_TDD\_FR2\_A | dBm/SCS Note3 | -85 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
|  | | dB | 18 |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -56 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | |

A.7.5.6.2.1.2 Test Requirements

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

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

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

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

A.7.5.7 PSCell addition and release delay

#### A.7.5.7.1 Addition and Release Delay of known NR PSCell

##### A.7.5.7.1.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell addition and release delay requirements defined in clauses 8.9.2 and 8.9.3, respectively, for the case where the PSCell is known to the UE at the time of addition.

The supported test configurations are given in Table A.7.5.7.1.1-1. The test scenario comprises two NR cells, Cell 1 and Cell 2, on radio channel 1 in FR1 and radio channel 2 in FR2, respectively. Test parameters are given in Tables A.7.5.7.1.1-2, A.7.5.7.1.1-3 and A.7.5.7.1.1-4 below. The test consists of five time periods with durations T1, T2, T3, T4 and T5, respectively.

At the start of T1, the UE shall be connected to Cell 1 (PCell) on radio channel 1 (PCC) and shall only monitor PCC and hence be unaware of Cell 2 (PSCell-to-be) on radio channel 2. Before the start of T2, the test system shall send measurement control information including measurement gap configuration and event-triggered reporting configuration for measurements on radio channel 2.

During T2, the Cell2 becomes known to the UE. Therefore, during T2 the UE shall report Event triggered report.

The point in time at which the RRC message to release measurement gap is transmitted from the test system defines the start of period T3. During T3, after measurement gap is released, the test system transmits the RRC message to the UE to add PSCell on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added.

The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

During T4, the UE shall carry out random access towards the PSCell. Reception by the test system of the PRACH preamble defines the start of T5.

During T5, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send a RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T6.

During T6, the UE shall release the PSCell.

**Table A.7.5.7.1.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

**Table A.7.5.7.1.1-2: General test parameters for PSCell addition and release delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test |
| Active PCell | |  | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell | |  | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| A4 | Hysteresis | dB | 0 | Hysteresis for event A4 |
| Threshold RSRP | dBm | -118 | Threshold for event A4 |
| Time to Trigger | S | 0 | Time to trigger for event A4 |
| DRX | |  | OFF | For both PCell and PSCell once activated |
| Measurement gap pattern ID | |  | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration in Cell 2 | |  | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | | ms | 2 |  |
| T1 | | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | | s | 1 | During this time the UE shall identify neighbour cell 2 and report event B1. |
| T3 | | s | 3.5 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |
| T4 | | s | 1 | During this time the UE adds the PSCell. |
| T5 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T6 | | s | 1 | During this time the UE releases the PSCell. |

**Table A.7.5.7.1.1-3: NR Cell specific test parameters for PSCell addition and release delay**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | **Cell2** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| Frequency Range |  | 1,2,3 | FR1 | FR2 | | | | |
| Duplex mode |  | 1 | FDD | TDD | | | | |
| 2,3 | TDD |
| TDD configuration |  | 1 | – | TDDConf.3.1 | | | | |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | MHz | 1,2 | 10: NRB,c = 52 | 100: NRB,c = 66 | | | | |
| 3 | 40: NRB,c = 106 |
| Data RBs allocated |  | 1,2 | 52 | 48 | | | | |
| 3 | 106 |
| Initial Downlink BWP configuration |  | 1,2,3 | DLBWP.0.1 | DLBWP.0.1 | | | | |
| Initial Uplink BWP configuration |  | 1,2,3 | ULBWP.0.1 | ULBWP.0.1 | | | | |
| Dedicated Downlink BWP configuration |  | 1,2,3 | DLBWP.1.1 | DLBWP.1.1 | | | | |
| Dedicated Uplink BWP configuration |  | 1,2,3 | ULBWP.1.1 | ULBWP.1.1 | | | | |
| PDSCH Reference Measurement Channel |  | 1 | SR.1.1 FDD | SR.3.3 TDD | | | | |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| TRS configuration |  | 1,2,3 | – | TRS.2.1 TDD | | | | |
| TCI state |  | 1,2,3 | – | TCI.State.0 | | | | |
| RMSI CORESET parameters |  | 1 | CR.1.1 FDD | CR.3.2 TDD | | | | |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET parameters |  | 1 | CCR.1.1 FDD | CCR.3.7 TDD | | | | |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| OCNG PatternsNote1 |  | 1,2,3 | OP.1 | OP.3 | | | | |
| SSB configuration |  | 1,2 | SSB.1 FR1 | SSB.2 FR2 | | | | |
| 3 | SSB.2 FR1 |
| SMTC configuration |  | 1,2,3 | SMTC.2 | SMTC.1 | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 15 | 120 | | | | |
|  |  | 3 | 30 |  | | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3 | 0 | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Propagation Condition |  | 1,2,3 | N/A | AWGN | | | | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: Void | | | | | | | | |

Table A.7.5.7.1.1-4: OTA related test parameters for PSCell addition and release delay

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | **Cell 2** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| Angle of arrival configuration |  | 1,2,3 | Link only, see clause A.3.7A | Setup 2a according to clause A.3.15.2.1 | | | | |
| Assumption for UE beams Note 3 |  |  | Rough | | | | |
| Ês | dBm/SCS | 1,2,3 | -∞ | -81 | | | |
| SSB\_RP Note1, Note2 | dBm/SCS | 1,2,3 | -∞ | -81 | | | |
| BB Note1, Note 4 | dB | 1,2,3 | -∞ | 4.88 | | | |
| Io Note 1, Note2 | dBm/95.04 MHz | 1,2,3 | N/A | -56.41 | | | |
| Note 1: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.  Note 3: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |

A.7.5.7.1.2 Test Requirements

The UE shall transmit the PRACH preamble to PSCell at latest 112 ms into T3.

The UE shall transmit at least one periodic CSI report for PSCell during T4.

The UE shall stop transmitting CSI reports for PSCell at latest 20 ms into T5.

All of the above test requirements shall be fulfilled in order for the observed PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.7.5.7.2 Addition and Release Delay of unknown NR PSCell

##### A.7.5.7.2.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell addition and release delay requirements defined in clauses 8.9.2 and 8.9.3, respectively, for the case where the PSCell is unknown to the UE at the time of addition.

The supported test configurations are given in Table A.7.5.7.2.1-1. The test scenario comprises two NR cells, Cell 1 and Cell 2, on radio channel 1 in FR1 and radio channel 2 in FR2, respectively. Test parameters are given in Tables A.7.5.7.2.1-2, A.7.5.7.2.1-3 and A.7.5.7.2.1-4 below. The test consists of four time periods with durations T1, T2, T3 and T4, respectively.

At the start of T1, the UE shall be connected to Cell 1 (PCell) on radio channel 1 (PCC) and shall only monitor PCC and hence be unaware of Cell 2 (PSCell-to-be) on radio channel 2. At the end of T1, the test system shall send a RRC message instructing the UE to add PSCell (Cell 2), and further instructing the UE to report CSI periodically in the PSCell once it has been added. Reception by the UE of this RRC message defines the start of T2.

During T2, the UE shall identify PSCell and carry out random access towards the PSCell. Reception by the test system of the PRACH preamble defines the start of T3.

During T3, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send a RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T4.

During T4, the UE shall release the PSCell.

**Table A.7.5.7.2.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

**Table A.7.5.7.2.1-2: General test parameters for PSCell addition and release delay**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | Two radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell |  | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| DRX |  | OFF | For both PCell and PSCell once activated |
| PRACH configuration in Cell 2 |  | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | ms | [2] |  |
| T1 | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | s | 1 | During this time the UE adds the PSCell. |
| T3 | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | s | 1 | During this time the UE releases the PSCell. |

Table A.7.5.7.2.1-3: NR Cell specific test parameters for PSCell addition and release delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | **Cell2** | | | |
| **T1** | **T2** | **T3** | **T4** |
| Frequency Range |  | 1,2,3 | FR1 | FR2 | | | |
| Duplex mode |  | 1 | FDD | TDD | | | |
| 2,3 | TDD |
| TDD configuration |  | 1 | – | TDDConf.3.1 | | | |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | MHz | 1,2 | 10: NRB,c = 52 | 100: NRB,c = 66 | | | |
| 3 | 40: NRB,c = 106 |
| Data RBs allocated |  | 1,2 | 52 | 48 | | | |
| 3 | 106 |
| Initial Downlink BWP configuration |  | 1,2,3 | DLBWP.0.1 | DLBWP.0.1 | | | |
| Initial Uplink BWP configuration |  | 1,2,3 | ULBWP.0.1 | ULBWP.0.1 | | | |
| Dedicated Downlink BWP configuration |  | 1,2,3 | DLBWP.1.1 | DLBWP.1.1 | | | |
| Dedicated Uplink BWP configuration |  | 1,2,3 | ULBWP.1.1 | ULBWP.1.1 | | | |
| PDSCH Reference Measurement Channel |  | 1 | SR.1.1 FDD | SR.3.3 TDD | | | |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| TRS configuration |  | 1,2,3 | – | TRS.2.1 TDD | | | |
| TCI state |  | 1,2,3 | – | TCI.State.0 | | | |
| RMSI CORESET parameters |  | 1 | CR.1.1 FDD | CR.3.2 TDD | | | |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET parameters |  | 1 | CCR.1.1 FDD | CCR.3.7 TDD | | | |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| OCNG PatternsNote1 |  | 1,2,3 | OP.1 | OP.3 | | | |
| SSB configuration |  | 1,2 | SSB.1 FR1 | SSB.2 FR2 | | | |
| 3 | SSB.2 FR1 |
| SMTC configuration |  | 1,2,3 | SMTC.2 | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 15 | 120 | | | |
|  |  | 3 | 30 |  | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3 | 0 | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Propagation Condition |  | 1,2,3 | AWGN | AWGN | | | |
| Note 1: OCNG shall be used such that and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: Void | | | | | | | |

Table A.7.5.7.2.1-4: OTA related test parameters for PSCell addition and release delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | **Cell 2** | | | |
| **T1** | **T2** | **T3** | **T4** |
| Angle of arrival configuration |  | 1,2,3 | Link only, see clause A.3.7A | Setup 2a according to clause A.3.15.2.1 | | | |
| Assumption for UE beams Note 3 |  |  | Rough | | | |
| Ês | dBm/SCS | 1,2,3 | -∞ | -81 | | |
| SSB\_RP Note1, Note 2 | dBm/SCS | 1,2,3 | -∞ | -81 | | |
| BB Note1, Note 4 | dB | 1,2,3 | -∞ | 4.88 | | |
| Io Note 1, Note 2 | dBm/95.04 MHz | 1,2,3 | N/A | -56.41 | | |
| Note 1: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.  Note 3: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

A.7.5.7.2.2 Test Requirements

The UE shall transmit the PRACH preamble to PSCell at latest 572 ms into T2.

The UE shall transmit at least one periodic CSI report for PSCell during T3.

The UE shall stop transmitting CSI reports for PSCell at latest 20 ms into T4.

All of the above test requirements shall be fulfilled in order for the observed PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

A.7.5.8 Active TCI state switch delay

#### A.7.5.8.1 MAC-CE based active TCI state switch

A.7.5.8.1.1 NR PCell FR2 active TCI state switch for a known TCI state

A.7.5.8.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configuration is shown in Table A.7.5.8.1.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.7.5.8.1.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.7.5.8.1.1.1-3 below. The OTA related test parameters for FR2 are shown in Table A.7.5.8.1.1.1-4.

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

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL’d to SSB0) and TCIstate 1 (QCL’d to SSB1), in Cell 1 before starting the test.

- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure A.7.5.8.1.1.1-1 and Figure A.7.5.8.1.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 till n+ THARQ +3 ms. The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+ THARQ +3 ms + (Tfirst-SSB + TSSB-proc) .

**Table A.7.5.8.1.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.8.1.1.1-2: General test parameters for TCI state switch**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

Table A.7.5.8.1.1.1-3: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TC. State.2 |
| TCI State 1 |  | TCI.State.3 |
| TRS Configuration |  | TRS.2.1 TDD  TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table A.7.5.8.1.1.1-4: OTA related test parameters for TCI state switch**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | | |
|  |  | SSB0 | | SSB1 | | |
|  |  | T1 | T2 | T1 | | T2 |
| Angle of arrival configuration |  | Setup 3 According to clause A.3.15.3 | | | | |
|  |  | AoA1 | | | AoA2 | |
| Assumption for UE beams Note 6 |  | Rough | | | Rough | |
| Ês | dBm/SCS | -80.6 | -80.6 | -Infinity | | -80.6 |
| SSB-RP Note 2 | dBm/SCS | -80.6 | -80.6 | -Infinity | | -80.6 |
| BB Note 7 | dB | 8.3 | 8.3 | -Infinity | | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | | -56.0 |
| Note 1: Void  Note 2: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |



Figure A.7.5.8.1.1.1-1: Time multiplexed downlink transmissions during T1



Figure A.7.5.8.1.1.1-2: Time multiplexed downlink transmissions during T2

A.7.5.8.1.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ THARQ +3 ms

- be able to start receiving on TCI state 1 after n+ THARQ +5 ms + Tfirst-SSB

#### A.7.5.8.2 RRC based active TCI state switch

A.7.5.8.2.1 NR PCell FR2 active TCI state switch for a known TCI state

A.7.5.8.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configuration is shown in Table A.7.5.8.2.1.1-1.

The test scenario comprises of one NR PCell as given in Table A.7.5.8.2.1.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.8.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.8.2.1.1-4.

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

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is configured with 1 TCI state for PCell, PDCCH-TCI-state0 (QCL’d to SSB0)

- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. Figure A.7.5.8.2.1.1-1 and Figure A.7.5.8.2.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI-state1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+ TRRC\_processing  + Tfirst-SSB + 2ms.

**Table A.7.5.8.2.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.8.2.1.1-2: General test parameters for TCI state switch**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

Table A.7.5.8.2.1.1-3: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TC. State.2 |
| TCI State 1 |  | TCI.State.3 |
| reportConfigType |  | ssb-Index-RSRP |
| reportConfigType |  | periodic |
| Number of reported RS |  | 2 |
| L1-RSRP reporting period | slot | 640 |
| timeRestrictionForChannelMeasurements |  | configured |
| TRS Configuration |  | TRS.2.1 TDD  TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table A.7.5.8.2.1.1-4: OTA related test parameters for TCI state switch**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | | | |
| **SSB0** | | **SSB1** | | |
| **T1** | **T2** | **T1** | | **T2** |
| Angle of arrival configuration |  | Setup 3 According to clause A.3.15.3 | | | | |
| AoA1 | | | AoA2 | |
| Assumption for UE beams Note 6 |  | Rough | | | Rough | |
| Ês | dBm/SCS | -80.6 | -80.6 | -Infinity | | -80.6 |
| SSB-RP Note 2 | dBm/SCS | -80.6 | -80.6 | -Infinity | | -80.6 |
| BB Note 7 | dB | 8.3 | 8.3 | -Infinity | | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | | -56.0 |
| Note 1: Void  Note 2: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |



Figure A.7.5.8.2.1.1-1: Time multiplexed downlink transmissions during T1



Figure A.7.5.8.2.1.1-2: Time multiplexed downlink transmissions during T2

A.7.5.8.2.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after n+ TRRC\_processing  + Tfirst-SSB + 2ms.

## A.7.6 Measurement procedure

A.7.6.1 Intra-frequency Measurements

#### A.7.6.1.1 SA event triggered reporting test without gap under non-DRX

##### A.7.6.1.1.1 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 TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.1.1-1.

**Table A.7.6.1.1.1-1: supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.1.1-2, A.7.6.1.1.1-3 and A.7.6.1.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The 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.

**Table A.7.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Value** | **Comment** |
| Active cell |  | 1, 2 | PCell (Cell 1) |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration |  | 1, 2 | SMTC.1 |  |
| A3-Offset | dB | 1, 2 | -11 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | OFF |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

**Table A.7.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1 | 24 | | 24 | |
| 2 | 48 | | 48 | |
| Intial BWP configuration |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states |  | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns |  | 1, 2 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1~2 | N/A | | 16 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.7 FR2 | |
| 2 | SSB.4 FR2 | | SSB.8 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | AWGN | |

**Table A.7.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | | | **Cell 2** | |
| **T1** | **T2** | | | **T1** | **T2** |
| AoA setup |  | 1, 2 | Setup 3 defined in A.3.15.3 | | | | | |
| AoA1 | | | | AoA2 | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | | Rough | |
| Es | dBm/SCS | 1 | -89 | | -89 | | -Infinity | -89 |
| 2 | -86 | | -86 | | -Infinity | -86 |
| BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | | | -Infinity | -0.12 |
| SSB\_RP | dBm/SCS | 1 | -89 | -89 | | | -Infinity | -89 |
| 2 | -86 | -86 | | | -Infinity | -86 |
|  | dBm/95.04MHz | 1 | -64.41 | | | -64.41 | -Infinity | -64.41 |
| 2 | -61.41 | | | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure A.7.6.1.1.1-1 | | | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Void  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |



Figure A.7.6.1.1.1-1: Time multiplexed downlink transmissions (Config 1 example)

##### A.7.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,

- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

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

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

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

#### A.7.6.1.2 SA event triggered reporting test without gap under DRX

##### A.7.6.1.2.1 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 TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.2.1-1.

**Table A.7.6.1.2.1-1: supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.2.1-2 ~ 6.

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

**Table A.7.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| Active cell |  | 1, 2 | PCell (Cell 1) | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration |  | 1, 2 | SMTC.1 | |  |
| A3-Offset | dB | 1, 2 | -6 | |  |
| CP length |  | 1, 2 | Normal | |  |
| Hysteresis | dB | 1, 2 | 0 | |  |
| Time To Trigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | DRX.1 | DRX.7 | DRX related parameters are defined in Table A.7.6.1.2.1-5 |
|  |  |  |  | |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 10 | 52 |  |

**Table A.7.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | | |
| **T1** | **T2** | **T1** | | **T2** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | | |
| Intial BWP configuration |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | | |
| RLM-RS |  | 1, 2 | SSB | | SSB | | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | | |
| 2 | CR.3.2 TDD | | N/A | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | | |
| 2 | CCR.3.7 TDD | | N/A | | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | | |
| PDSCH/PDCCH TCI states |  | 1, 2 | TCI.State.2 | | N/A | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.3 FR2 | | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | AWGN | |

**Table A.7.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup |  | 1, 2 | Setup 1 defined in A.3.15.1 | | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | |
| BB Note 5 | dB | 1, 2 | 3.77 | -1.52 | -Infinity | -1.52 |
| Note 2 | dBm/15 KHz | 1, 2 | -98 | | | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| 2 | -86 | | | |
| SSB\_RP | dBm/SCS | 1 | -85 | -85 | -Infinity | -85 |
| 2 | -82 | -82 | -Infinity | -82 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
|  | dBm/95.04MHz | 1, 2 | -54.53 | -52.18 | See Cell 1 columns | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

Table A.7.6.1.2.1-5: Void

Table A.7.6.1.2.1-6: Void

##### A.7.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,

- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,

- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

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

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

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

#### A.7.6.1.3 SA event triggered reporting test with per-UE gaps under non-DRX

##### A.7.6.1.3.1 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 TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.3.1-1.

**Table A.7.6.1.3.1-1: supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.3.1-2 ~ 4 below.

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

In 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.

Table A.7.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Value** | **Comment** |
| Active cell |  | 1, 2 | PCell (Cell 1) |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Gap type |  | 1, 2 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1, 2 | 40 |  |
| Measurement gap length | ms | 1, 2 | 6 |  |
| Measurement gap offset | ms | 1, 2 | 39 |  |
| SMTC configuration |  | 1, 2 | SMTC.1 |  |
| CSI-RS parameters |  | 1, 2 | CSI-RS.3.2 TDD resource #0 | Resource #1 is not used |
| A3-Offset | dB | 1, 2 | -11 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | OFF |  |
|  |  |  |  |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

**Table A.7.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1 | 24 | | 24 | |
| 2 | 48 | | 48 | |
| Intial BWP configuration |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | CSI-RS | | SSB | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states |  | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns |  | 1, 2 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1~2 | N/A | | 16 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.7 FR2 | |
| 2 | SSB.4 FR2 | | SSB.8 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | AWGN | |

**Table A.7.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup |  | 1, 2 | Setup 3 defined in A.3.15.3 | | | |
| AoA1 | | AoA2 | |
| Beam AssumptionNote 4 |  | 1,2 | Rough | | Rough | |
| Es | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| 2 | -86 | -86 | -Infinity | -86 |
| BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB\_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| 2 | -86 | -86 | -Infinity | -86 |
|  | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| 2 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1 | Defined in Figure A.7.6.1.3.1-1 | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Void  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |



Figure A.7.6.1.3.1-1: Time multiplexed downlink transmissions (Config 1 example)

##### A.7.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,

- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

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

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

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

#### A.7.6.1.4 SA event triggered reporting test with per-UE gaps under DRX

##### A.7.6.1.4.1 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 TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.4.1-1.

**Table A.7.6.1.4.1-1: supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.4.1-2, A.7.6.1.4.1-3 and A.7.6.1.4.1-4 below.

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

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

**Table A.7.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| Active cell |  | 1, 2 | PCell (Cell 1) | |  |
| Neighbour cell |  | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| Gap type |  | 1, 2 | Per-UE gaps | |  |
| Measurement gap repitition periodicity | ms | 1, 2 | 40 | |  |
| Measurement gap length | ms | 1, 2 | 6 | |  |
| Measurement gap offset | ms | 1, 2 | 39 | |  |
| SMTC configuration |  | 1, 2 | SMTC.1 | |  |
| CSI-RS parameters |  | 1, 2 | CSI-RS.3.2 TDD resource #0 | | Resource #1 is not used |
| A3-Offset | dB | 1, 2 | -6 | |  |
| CP length |  | 1, 2 | Normal | |  |
| Hysteresis | dB | 1, 2 | 0 | |  |
| Time To Trigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | DRX.1 | DRX.7 | DRX related parameters are defined in Table A.7.6.1.2.1-5 |
|  |  |  |  | |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 10 | 52 |  |

**Table A.7.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1, 2 | 66 | | 66 | |
| Intial BWP configuration |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SCSI-RS | | SSB | |
| PDSCH RMC configuration |  | 1 | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state |  | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| SSB |  | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1, 2 | AWGN | | AWGN | |

**Table A.7.6.1.4.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup |  | 1, 2 | Setup 1 defined in A.3.15.1 | | | |
| Beam AssumptionNote 4 |  | 1,2 | Rough | | | |
| BB Note 5 | dB | 1, 2 | 3.77 | -1.52 | -Infinity | -1.52 |
| Note 2 | dBm/15 KHz | 1, 2 | -98 | | | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| 2 | -86 | | | |
| SSB\_RP | dBm/SCS | 1 | -85 | -85 | -Infinity | -85 |
| 2 | -82 | -82 | -Infinity | -82 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
|  | dBm/95.04MHz | 1, 2 | -54.53 | -52.18 | See Cell 2 columns | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

Table A.7.6.1.4.1-5: Void

Table A.7.6.1.4.1-6:Void

##### A.7.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,

- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,

- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

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

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

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

A.7.6.2 Inter-frequency Measurements

#### A.7.6.2.1 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2)

##### A.7.6.2.1.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.1.1-1, A.7.6.2.1.1-2, and A.7.6.2.1.1-3.

Measurement gap pattern configuration # 13 as defined in Table A.7.6.2.1.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

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

Supported test configurations are shown in table A.7.6.2.1.1-1.

Table A.7.6.2.1.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. | |

Table A.7.6.2.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| NR RF Channel Number |  | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 5.2 for PC1; 3.5 for other PC |  |

Table A.7.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 3 as specified in clause A.3.15 | | | |
| AoA1 | | AoA2 | |
| Beam AssumptionNote 7 | |  | 1,2 | Rough | | Rough | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Ês | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| BB Note 8 | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | |  | Config 1 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

##### A.7.6.2.1.2 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.2 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is used (PCell in FR2)

##### A.7.6.2.2.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.2.1-1, A.7.6.2.2.1-2, and A.7.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table A.7.6.2.2.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

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

Supported test configurations are shown in table A.7.6.2.2.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

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

Table A.7.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. | |

Table A.7.6.2.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| NR RF Channel Number |  | Config 1 | 1, 2 | | Two FR2 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 | |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -6 | |  |
| Hysteresis | dB | Config 1 | 0 | |  |
| CP length |  | Config 1 | Normal | |  |
| TimeToTrigger | s | Config 1 | 0 | |  |
| Filter coefficient |  | Config 1 | 0 | | L3 filtering is not used |
| DRX |  | Config 1 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | |  |
| T2 | s | Config 1 | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC |  |

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 |  | -104.7 | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.7.6.2.2.2 Test Requirements

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.3 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is not used (PCell in FR2)

##### A.7.6.2.3.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.3.1-1, A.7.6.2.3.1-2, and A.7.6.2.3.1-3.

Measurement gap pattern configuration # 13 as defined in Table A.7.6.2.3.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

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

Supported test configurations are shown in table A.7.6.2.3.1-1.

**Table A.7.6.2.3.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. | |

Table A.7.6.2.3.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 for PC1; 4.5 for other PC |  |

Table A.7.6.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 3 as specified in clause A.3.15 | | | |
| AoA1 | | AoA2 | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Ês | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| BB Note 8 | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | |  | Config 1 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

##### A.7.6.2.3.2 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

The UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.4 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is used (PCell in FR2)

##### A.7.6.2.4.1 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 SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.4.1-1, A.7.6.2.4.1-2, and A.7.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table A.7.6.2.4.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

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

Supported test configurations are shown in table A.7.6.2.4.1-1.

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

**Table A.7.6.2.4.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. | |

Table A.7.6.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| NR RF Channel Number |  | Config 1 | 1, 2 | | Two FR2 NR carrier frequencies is used. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 | |  |
| SMTC-SSB parameters |  | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -6 | |  |
| Hysteresis | dB | Config 1 | 0 | |  |
| CP length |  | Config 1 | Normal | |  |
| TimeToTrigger | s | Config 1 | 0 | |  |
| Filter coefficient |  | Config 1 | 0 | | L3 filtering is not used |
| DRX |  | Config 1 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | |  |
| T2 | s | Config 1 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC |  |

Table A.7.6.2.4.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 |  | -104.7 | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SSB­\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
|  | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.7.6.2.4.2 Test Requirements

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.5 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1)

##### A.7.6.2.5.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.5.1-1, A.7.6.2.5.1-2, and A.7.6.2.5.1-3.

In test 1 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 no gap pattern is configured as defined in Table A.7.6.2.5.1-2. If the UE supports per-FR gap, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 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.

Supported test configurations are shown in table A.7.6.2.5.1-1.

Table A.7.6.2.5.1-1 SA event triggered reporting tests without SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| **Config** | **Description of serving cell** | **Description of target cell** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD 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 | | |

Table A.7.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | One NR FR1 and one NR FR2 carrier frequency is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | Gap not configured | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | N/A |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 2 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 3 | SSB.2 FR1 | | As specified in clause A.3.10.1 |
| CSI-RS for tracking parameters on NR RF Channel 1 |  | Config 1 | TRS.1.1 FDD | |  |
|  | Config 2 | TRS.1.1 TDD | |  |
|  | Config 3 | TRS.1.2 TDD | |  |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | |  |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | |  |
| CP length |  | Config 1,2,3 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 5.2 for PC1; 3.5 for other PC | 3 for PC1; 2 for other PC |  |

Table A.7.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1,2,3 | N/A | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 52 | | 66 | |
|  | |  | Config 2 | 52 | | 66 | |
|  | |  | Config 3 | 106 | | 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR2.1 TDD | |
| RMSI CORESET Reference  Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | Config 2 | CR.1.1 TDD | |
|  | Config 3 | CR2.1 TDD | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | - | |
|  | |  | Config 2 | CCR.1.1 TDD | |  | |
|  | |  | Config 3 | CCR.2.1 TDD | |  | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Ês | | dBm/SCS | Config 1,2,3 |  | | -Infinity | -87 |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1,2 |  | | -Infinity | -87 |
| BB Note 8 | | dB | Config 1,2,3 | Link only, see clause | | -Infinity | 14.69 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1,2,3 | A.3.7A | | -Infinity | -58.01 |
| Propagation Condition | |  | Config 1,2,3 |  | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

##### A.7.6.2.5.2 Test Requirements

In test 1, with per-UE , the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 2, without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

2560 for UE supporting power class 1, or

1600 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.6 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1)

##### A.7.6.2.6.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.6.1-1, A.7.6.2.6.1-2, and A.7.6.2.6.1-3.

In test 1&2 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 no gap pattern is configured as defined in Table A.7.6.2.6.1-2. If a UE supports per-FR gap it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 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.

Supported test configurations are shown in table A.7.6.2.6.1-1.

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

Table A.7.6.2.6.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| **Config** | **Description of serving cell** | **Description of target cell** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD 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.7.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | | | **Comment** |
| **Test 1** | **Test 2** | **Test 3** | **Test 4** |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | | | One NR FR1 and one NR FR2 carrier frequency is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | | Gap not configured | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | | N/A | |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 2 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 3 | SSB.2 FR1 | | | | As specified in clause A.3.10.1 |
| CSI-RS for tracking parameters on NR RF Channel 1 |  | Config 1 | TRS.1.1 FDD | | | |  |
|  | Config 2 | TRS.1.1 TDD | | | |  |
|  | Config 3 | TRS.1.2 TDD | | | |  |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | | | As specified in clause A.3.10.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | | | |  |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | | | |  |
| CP length |  | Config 1,2,3 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | DRX.1 | DRX.7 | 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 | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC |  |

Table A.7.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1,2,3 | NA | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 52 | | 66 | |
|  | |  | Config 2 | 52 | | 66 | |
|  | |  | Config 3 | 106 | | 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR2.1 TDD | |
| RMSI CORESET Reference Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | Config 2 | CR.1.1 TDD | |
|  | Config 3 | CR2.1 TDD | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | - | |
|  | |  | Config 2 | CCR.1.1 TDD | |  | |
|  | |  | Config 3 | CCR.2.1 TDD | |  | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 |  | NA  Link only, see clause A.3.7A | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1,2 | -95.7 | |
| Config 3 | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1,2 | -Infinity | -86.7 |
| Config 3 | -Infinity | -86.7 |
|  | | dB | Config 1,2,3 | -Infinity | 9 |
|  | | dB | Config 1,2,3 | -Infinity | 9 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | - | - |
| dBm/38.16MHz | Config 3 | - | - |
| dBm/95.04 MHz Note5 | Config 1,2,3 | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1,2,3 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.7.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.7 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1)

##### A.7.6.2.7.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.7.1-1, A.7.6.2.7.1-2, and A.7.6.2.7.1-3.

In test 1 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement no gap pattern is configured as defined in Table A.7.6.2.7.1-2. If the UE supports per-FR gap, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 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.

Supported test configurations are shown in table A.7.6.2.7.1-1.

Table A.7.6.2.7.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| **Config** | **Description of serving cell** | **Description of target cell** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD 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.7.6.2.7.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | One NR FR1 and one NR FR2 carrier frequency is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | Gap not configured | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | N/A |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 2 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 3 | SSB.2 FR1 | | As specified in clause A.3.10.1 |
| CSI-RS for tracking parameters on NR RF Channel 1 |  | Config 1 | TRS.1.1 FDD | |  |
|  | Config 2 | TRS.1.1 TDD | |  |
|  | Config 3 | TRS.1.2 TDD | |  |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | |  |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | |  |
| CP length |  | Config 1,2,3 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 7 for PC1; 4.5 for other PC | 3.5 for PC1; 2.5 for other PC |  |

**Table A.7.6.2.7.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1,2,3 | NA | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 52 | | 66 | |
|  | |  | Config 2 | 52 | | 66 | |
|  | |  | Config 3 | 106 | | 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR2.1 TDD | |
| RMSI CORESET Reference  Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | Config 2 | CR.1.1 TDD | |
|  | Config 3 | CR2.1 TDD | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | - | |
|  | |  | Config 2 | CCR.1.1 TDD | |  | |
|  | |  | Config 3 | CCR.2.1 TDD | |  | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Ês | | dBm/SCS | Config 1,2, 3 |  | | -Infinity | -87 |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1,2 |  | | -Infinity | -87 |
|  | |  | Config 3 |  | | -Infinity | -87 |
| BB Note 8 | | dB | Config 1,2,3 | Link only, see clause | | -Infinity | 14.69 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1,2,3 | A.3.7A | | Infinity | -58.01 |
| Propagation Condition | |  | Config 1,2,3 |  | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

##### A.7.6.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 2 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

3360 for UE supporting power class 1, or

2080 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.2.8 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1)

##### A.7.6.2.8.1 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 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.8.1-1, A.7.6.2.8.1-2, and A.7.6.2.8.1-3.

In test 1&2 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement no gap pattern is configured as defined in Table A.7.6.2.8.1-2.If a UE supports per-FR gap , it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 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.

Supported test configurations are shown in table A.7.6.2.8.1-1.

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

Table A.7.6.2.8.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| **Config** | **Description of serving cell** | **Description of target cell** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD 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.7.6.2.8.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | | | **Comment** |
| **Test 1** | **Test 2** | **Test 3** | **Test 4** |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | | | One NR FR1 and one NR FR2 carrier frequency is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | | Gap not configured | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | | N/A | |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 2 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 3 | SSB.2 FR1 | | | | As specified in clause A.3.10.1 |
| CSI-RS for tracking parameters on NR RF Channel 1 |  | Config 1 | TRS.1.1 FDD | | | |  |
|  | Config 2 | TRS.1.1 TDD | | | |  |
|  | Config 3 | TRS.1.2 TDD | | | |  |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3 | SSB.3 FR2 | | | | As specified in clause A.3.10.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | | | |  |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | | | |  |
| CP length |  | Config 1,2,3 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | DRX.1 | DRX.7 | 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 | 11 for PC1; 6.5 for other PCTBD | 108 for PC1; 67 for other PCTBD | 11 for PC1; 6.5 for other PCTBD | 108 for PC1; 67 for other PCTBD |  |

Table A.7.6.2.8.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1,2,3 | NA | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 | |  | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | TDD | |
|  | Config 2,3 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | Not Applicable | | TDDConf.3.1 | |
|  | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 52 | | 66 | |
|  | |  | Config 2 | 52 | | 66 | |
|  | |  | Config 3 | 106 | | 66 | |
| BWP BW | | MHz | Config 1 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| Initial UL BWP |  | ULBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | DLBWP.1.1 | | N/A | |
| Dedicated UL BWP |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | | - | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR2.1 TDD | |
| RMSI CORESET Reference  Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | Config 2 | CR.1.1 TDD | |
|  | Config 3 | CR2.1 TDD | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.1.1 FDD | | - | |
|  | |  | Config 2 | CCR.1.1 TDD | |  | |
|  | |  | Config 3 | CCR.2.1 TDD | |  | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | Config 1 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | |  | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz Note5 |  | NA  Link only, see clause A.3.7A | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1,2 | -95.7 | |
| Config 3 | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1,2 | -Infinity | -86.7 |
| Config 3 | -Infinity | -86.7 |
|  | | dB | Config 1,2,3 | -Infinity | 9 |
|  | | dB | Config 1,2,3 | -Infinity | 9 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | - | - |
| dBm/38.16MHz | Config 3 | - | - |
| dBm/95.04 MHz Note5 | Config 1,2,3 | -66.7 | -57.2 |
| Propagation Condition | |  | Config 1,2,3 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | | |

##### A.7.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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.7.6.3 L1-RSRP measurement for beam reporting

#### A.7.6.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.7.6.3.1.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.7.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.7.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.7.6.3.1.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.1.2-1 and Table A.7.6.3.1.2-2 below.

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.7.6.3.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD |
|  | 2 |  | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
|  | 2 |  | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
|  | 2 |  | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| 2 | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | Off |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~2 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.7.6.3.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **SSB#0** | | **SSB#1** | |
| **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | | |
| Beam AssumptionNote 4 | 1-2 |  | Rough | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
| 2 | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 2 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| 2 | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.7.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

* 1680 for UE supporting power class 1
* 1200 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

#### A.7.6.3.2 SSB based L1-RSRP measurement when DRX is used

##### A.7.6.3.2.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.7.6.3.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.7.6.3.2.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.7.6.3.2.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.2.2-1 and Table A.7.6.3.2.2-2 below.

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.7.6.3.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD |
| 2 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| 2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| 2 | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| 2 | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | DRX.3 |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 3 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~2 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.7.6.3.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **SSB#0** | | **SSB#1** | |
| **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | | |
| Beam AssumptionNote 4 | 1-2 |  | Rough | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
| 2 | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 2 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| 2 | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.7.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

* 2880 for UE supporting power class 1
* 1920 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

#### A.7.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.7.6.3.3.1 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 9.5.4.2, with the testing configurations for NR cells in Table A.7.6.3.3.1-1.

Table A.7.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

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

##### A.7.6.3.3.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.3.2-1 and Table A.7.6.3.3.2-2 below.

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 480ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.3.3.2-1.

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.7.6.3.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| CSI-RS configuration | 1 |  | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| DRX configuration | 1 |  | Off |
| reportConfigType | 1 |  | aperiodic |
| reportQuantity | 1 |  | cri-RSRP |
| Number of reported RS | 1 |  | 2 |
| qcl-Info | 1 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1 |  | 8 |
| Propagation condition | 1 |  | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.7.6.3.3.2-1: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1 |  | Setup 1 according to A.3.15.1 | |
| Beam AssumptionNote 4 | 1 |  | Rough | |
| Note1 | 1 | dBm/15kHz | -105 | |
| Note1 | 1 | dBm/SSB SCS | -95.97 | |
|  | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1 | dB | 0 | 9 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.7.6.3.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.6.3.3.3-1.

For relative accuracy of CSI-RS0 compared with CSI-RS1, the UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.7.6.3.3.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| CSI-RS0 | CSI-RS \_RP0 -δ + Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP0 +δ + Gmax |
| CSI-RS1 | CSI-RS \_RP1 -δ + Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP1 +δ + Gmax |
| Note 1: CSI-RS\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

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

#### A.7.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.7.6.3.4.1 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 9.5.4.2, with the testing configurations for NR cells in Table A.7.6.3.4.1-1.

Table A.7.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

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

##### A.7.6.3.4.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.4.2-1 and Table A.7.6.3.4.2-2 below.

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 1440ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.3.4.2-1.

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.7.6.3.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1 |  | freq1 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
| CSI-RS configuration | 1 |  | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 |
| DRX configuration | 1 |  | DRX.3 |
| reportConfigType | 1 |  | aperiodic |
| reportQuantity | 1 |  | cri-RSRP |
| Number of reported RS | 1 |  | 2 |
| qcl-Info | 1 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1 |  | 8 |
| Propagation condition | 1 |  | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.7.6.3.4.2-1: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1 |  | Setup 1 according to A.3.15.1 | |
| Beam AssumptionNote 4 | 1 |  | Rough | |
| Note1 | 1 | dBm/15kHz | -105 | |
| Note1 | 1 | dBm/SSB SCS | -95.97 | |
|  | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1 | dB | 0 | 9 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.7.6.3.4.3 Test Requirements

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.6.3.4.3-1.

For relative accuracy of CSI-RS0 compared with CSI-RS1, the UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.7.6.3.4.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| CSI-RS0 | CSI-RS \_RP0 -δ + Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP0 +δ + Gmax |
| CSI-RS1 | CSI-RS \_RP1 -δ + Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP1 +δ + Gmax |
| Note 1: CSI-RS\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

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

## A.7.7 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.7.7.1 SS-RSRP

#### A.7.7.1.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

##### A.7.7.1.1.1 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 10.1.3.1.1 and 10.1.3.1.2 for intra-frequency measurements.

##### A.7.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.7.7.1.1.2-2 and A.7.7.1.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1. The test consists of two time phases T1 and T2.

Table A.7.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.1.1.2-2: SS-RSRP Intra frequency general test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **T1** | | **T2** | | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | |
| Cell ID |  | 489 | 0 | 489 | 0 | |
| SSB ARFCN |  | freq1 | | freq1 | | |
| Duplex mode |  | TDD | | TDD | | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 24 | | 24 | | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - | |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - | |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - | |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - | |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - | |
| PDSCH Reference measurement channel |  | SR.3.2 TDD | - | SR.3.2 TDD | - | |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - | |
| Dedicated CORESET Reference channel |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - | |
| OCNG Patterns |  | OP.3 | OP.3 | OP.3 | OP.3 | |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | |
| Time offset with Cell 1 | μs | - | 3 | - | 3 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: Void | | | | | | | |

Table A.7.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **T1** | | **T2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 7 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -91.6 | | N/A | |
| Note1 | dBm/SCSNote4 | -82.6 | | N/A | |
|  | dB | 6.0 | 1.0 | N/A | N/A |
| Es | dBm/SCSNote4 |  |  | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB\_RPNote2 | dBm/SCS | -76.6 | -81.6 | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| BB Note6 | dB | 2.44 | -5.98 | -5.98 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | | (Table B.2.2-2 Rx Beam Peak +29.70dB) | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.7.7.1.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.7.7.1.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T1 and T2:

Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

Table A.7.7.1.1.3-1: SS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| Cell 1 | SSB\_RP1 -δ +Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP1 +δ +Gmax |
| Cell 2 | SSB\_RP2 -δ +Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP2 +δ+Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.3.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

#### A.7.7.1.2 SA inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

##### A.7.7.1.2.1 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 10.1.5.1.1 and 10.1.5.1.2 for intrer-frequency measurements with the testing configurations for NR cells in Table A.7.7.1.2.1-1.

Table A.7.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

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

##### A.7.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

Table A.7.7.1.2.2-1: SS-RSRP inter-frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | 1~2 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1~2 |  | 100:  NRB,c = 66 | | 100:  NRB,c = 66 | |
| Data RBs allocated | 1 |  | 24 | | 24 | |
| 2 | 48 | | 48 | |
| Gap pattern ID |  |  | 0 | | 0 | |
| Duplex mode | 1~2 |  | TDD | | TDD | |
| TDD configuration | 1~2 |  | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | - | SR.3.2 TDD | - |
| 2 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.2 TDD | - | CR.3.2 TDD | - |
| 2 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| 2 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.3 FR2 | | SSB.3 FR2 | |
| 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~2 |  | OP.3 | | OP.3 | |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~2 |  | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 1 | 1~2 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~2 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void | | | | | | |

Table A.7.7.1.2.2-2: SS-RSRP inter frequency OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration | 1~2 |  | Setup 4b according to clause A.3.15.4.2 | | Setup 4b according to clause A.3.15.4.2 | |
| AoA1  Spherical coverage | AoA2  Rx Beam Peak | AoA1  Spherical coverage | AoA2  Rx Beam Peak |
| Assumption for UE beamsNote 7 | 1~2 |  | Rough | | Rough | |
| Note1 | 1 | dBm/15kHzNote4 | -90.6 | -90.6 | (Table B.2.3-2 Rx Beam PeakNote 8 +1.97dB) | (Table B.2.3-2 Rx Beam PeakNote 8 -3.03dB) |
| 2 | -93.7 | -93.7 |
| Note1 | 1 | dBm/SCSNote4 | -81.6 | -81.6 | (Table B.2.3-2 Rx Beam PeakNote 8 +11.0dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +6.0dB) |
| 2 | -81.7 | -81.7 | (Table B.2.3-2 Rx Beam PeakNote 8 +14.0dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +9.0dB) |
|  | 1~2 | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| SSB\_RPNote2 | 1 | dBm/SCS | -75.6 | -75.6 | (Table B.2.3-2 Rx Beam PeakNote 8 +28.0dB) | (Table B.2. 3-2 Rx Beam PeakNote 8 +5.0dB) |
| 2 | -75.7 | -75.7 | (Table B.2.3-2 Rx Beam PeakNote 8 +31.0dB) | (Table B.2. 3-2 Rx Beam PeakNote 8 +8.0dB) |
| (SSB\_RPCell 1 – SSB\_RPCell 2) | 1~2 | dB | 0 | | 23.00 | |
| BBNote6 | 1 | dB | 5.26 | 5.96 | 9.53 | -3.46 |
| 2 | 4.61 | 5.91 |
| IoNote2 | 1 | dBm/95.04 MHz Note4 | -50.00 | -50.00 | (Table B.2.3-2 Rx Beam PeakNote 8 +52.68dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +33.13dB) |
| 2 | -50.09 | -50.09 | (Table B.2.3-2 Rx Beam PeakNote 8 +55.69dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +36.14dB) |
| (Iofreq 1 – Io freq 2) | 1~2 | dB | 0 | | 19.55 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot, Io, (SSB\_RPCell 2 – SSB\_RPCell 1) and (Iofreq 2 – Io freq 1) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP or ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: The value in Table B.2.3-2 is the Minimum SSB\_RP for SCSSSB = 120 kHz, selected according to the operating band of cell 2 and UE power class, without ∆MBP,n adjustment. | | | | | | |

##### A.7.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirements in clause 10.1.5.1.1 and the relative requirements in clause 10.1.5.1.2.

Test 1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.7.7.1.2.3-2.

Test 2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.7.7.1.2.3-2.

Table A.7.7.1.2.3-1: SS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3,4 |
| Cell 1 | SSB\_RP1 -δ +Gmin +X ≤ Reported RSRP(dBm) ≤ SSB\_RP1 +δ +Gmax |
| Cell 2 | SSB\_RP2 -δ +Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP2 +δ+Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  Note 4: X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. | |

Table A.7.7.1.2.3-2: SS-RSRP relative accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3,4, 5, 6 |
| Cell 2 – Cell 1 | SSB\_RP2 - SSB\_RP1 -δ - D - Ginter ≤ Reported RSRP(dB) ≤ SSB\_RP2 - SSB\_RP1 +δ + Ginter–(X) + [3] |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1  Note 3: Void  Note 4: X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value.  Note 5: D is the margin due to mis-alignment between fine beam and rough beam. D is the Rough Beam gain reduction in Rx beam peak direction from Table B.2.1.5.3-1, selected according to the UE power class. D is always a positive value.  Note 6: Ginter is the margin due to different antenna gain caused by frequency separation. Ginter is from Table B.2.1.5.2-1, selected according to the UE power class, and is always a positive value. | |

#### A.7.7.1.3 SA inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

##### A.7.7.1.3.1 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 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.7.7.1.3.1-1.

Table A.7.7.1.3.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

|  |  |  |
| --- | --- | --- |
| **Config** | **Description of serving cell** | **Description of target cell** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD 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 |

##### A.7.7.1.3.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) in FR1 and Cell 2 in FR2 . The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2 below. Absolute accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.7.7.1.3.2-1: SS-RSRP inter-frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~3 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1 | MHz | 10:  NRB,c = 52 | 100:  NRB,c = 66 | 10:  NRB,c = 52 | 100:  NRB,c = 66 |
| 2 | 10:  NRB,c = 52 | 10:  NRB,c = 52 |
| 3 | 40:  NRB,c = 106 | 40:  NRB,c = 106 |
| Data RBs allocated | 1,2 |  | 52 | 24 | 52 | 66 |
| 3 | 106 | 106 |
| Duplex mode | 1 |  | FDD | TDD | FDD | TDD |
| 2 | TDD | TDD |
| 3 | TDD | TDD |
| TDD configuration | 1 |  | N/A | TDDConf.3.1 | N/A | TDDConf.3.1 |
| 2 | TDDConf.1.1 | TDDConf.1.1 |
| 3 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD | SR.1.1 TDD |
| 3 | SR.2.1 FDD | SR.2.1 FDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| 2 |  | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| 3 |  | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | SSB.3 FR2 | SSB.1 FR1 | SSB.3 FR2 |
| 2 | SSB.1 FR1 | SSB.1 FR1 |
| 3 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | 1~3 |  | OP.1 | OP.3 | OP.1 | OP.1 |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~3 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~3 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~3 |  | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 1 | 1~3 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 | - | NA  Link only, see clause A.3.7A | AWGN | NA  Link only, see clause A.3.7A | AWGN |
| Antenna configuration | 1~3 | - | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void | | | | | | |

Table A.7.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** NOTE 3 | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration according to clause A.3.15 |  |  | NA | Setup 2b | NA | Setup 2b |
| Assumption for UE beamsNote 4 |  |  | N/A | Rough | N/A | Rough |
|  | 1~3 | dBm/15kHz | NA  Link only, see clause A.3.7A | -90 | NA  Link only, see clause A.3.7A | NA |
|  | 1~3 | dBm/SSB SCS | -80.97 | NA |
|  | 1~3 | dB | 5 | NA |
| Es | 1~3 | dBm/SCS |  | (Table B.2.3-2 Spherical coverage +1dB) |
| SSB\_RPNote1 | 1~3 | dBm/SCS | -76.0 | Table B.2.3-2 Spherical coverage +1dB) |
| BBNote6 | 1~3 | dB | 4.35 | -3.81 |
| IoNote1 | 1~3 | dBm/  95.04MHz | -50.18 | SSB\_RP+28.98 |
| Note 1: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.7.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

Test 1:

Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.3.3.

Test 2:

Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.3.3.

Table A.7.7.1.3.3: SS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3,4 |
| Cell 2 | SSB\_RP1 -δ +Gmin +X ≤ Reported RSRP(dBm) ≤ SSB\_RP1 +δ +Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  Note 4: X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. | |

### A.7.7.2 SS-RSRQ

#### A.7.7.2.1 SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

##### A.7.7.2.1.1 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 10.1.8.1.1.

##### A.7.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.2.1.2-1. . The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.7.7.2.1.2-2 and Table A.7.7.2.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell.

**Table A.7.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | **Test 2** | | |
| **Cell 1** | | **Cell 2** | **Cell 1** | **Cell 2** | |
| SSB ARFCN | |  | Freq1 | | | Freq1 | | |
| Duplex mode | |  | TDD | | | TDD | | |
| TDD configuration | |  | TDDConf.3.1 | | | TDDConf.3.1 | | |
| BWchannel | | MHz | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated | |  | 66 | | | 66 | | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | | | |
| Dedicated DL BWP | DLBWP.1.1 | | | | | |
| Initial UL BWP | ULBWP.0.1 | | | | | |
| Dedicated UL BWP | ULBWP.1.1 | | | | | |
| TRS configuration | |  | TRS.2.1 TDD | |  | TRS.2.1 TDD |  | |
| TCI state | |  | TCI.State.0 | |  | TCI.State.0 |  | |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | |  | SR.3.1 TDD |  | |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | | - | CR.3.1 TDD |  | |
| Control channel RMC | |  | CCR.3.1 TDD | | - | CCR.3.1 TDD | - | |
| OCNG Patterns | |  | OP.1 | | OP.1 | OP.1 | OP.1 | |
| SMTC configuration | |  | SMTC.1 | | | | | |
| SSB configuration | |  | SSB.1 FR2 | | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | 120 | 120 | 120 | |
| SS-RSSI-Measurement | |  | Not Applicable | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | 0 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Propagation condition | |  | AWGN | | | AWGN | | |
| Antenna configuration | |  | 1x2 | 1x2 | | 1x2 | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: Void | | | | | | | | |

Table A.7.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 9 |  | Rough | | | |
| Note1 | dBm/15kHzNote4 | -95 | | -95 | |
| Note1 | dBm/SCSNote3 | -86 | | -86 | |
|  | dB | 3 | -3 | -3 | 3 |
| SSB\_RPNote2 | dBm/SCS Note4 | -83 | -83 | -89 | -89 |
| SS-RSRQ Note2 | dB | -14.77 | -14.77 | -16.81 | -16.81 |
|  | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| IoNote2 | dBm/95.04 MHz Note4 | -50 | | -54 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRQ, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.7.2.1.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ-2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal RSRQ+3.5dB to Nominal RSRQ-3.5dB according to the requirements in clause 10.1.8.1.1.Nominal RSRQ is the value shown in table A.7.7.2.1.2-3.

#### A.7.7.2.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

##### A.7.7.2.2.1 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 for inter-frequency measurement.

##### A.7.7.2.2.2 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.7.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.7.7.2.2.2-2 and Table A.7.7.2.2.2-3.. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.7.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.2.2.2-2: SS-RSRQ Inter frequency general test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | |  | Freq1 | freq2 | freq1 | Freq2 |
| SSB Configuration | |  | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| Duplex mode | |  | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 66 | | 66 | |
|  | Initial DL BWP |  | DLBWP.0.1 | | | |
| BWP configuration | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| TRS configuration | |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | |  | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS | |
| EPRE ratio of PBCH to PBCH\_DMRS | |
| EPRE ratio of PDCCH\_DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |
| EPRE ratio of PDSCH\_DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
|  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |  |  |  |
| Propagation conditions | |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void | | | | | | |

Table A.7.7.2.2.2-3: SS-RSRQ Inter frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup |  | Setup 1 in clause A.3.15. | | Setup 1 in clause A.3.15. | |
| Assumption for UE beamsNote 8 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -94.03 | -94.03 | -94.03 | -94.03 |
| Note1 | dBm/SCSNote3 | -85.0 | -85.0 | -85.0 | -85.0 |
|  | dB | -1.75 | -1.75 | -3 | -1.75 |
| SSB\_RPNote2 | dBm/SCS Note4 | -86.75 | -86.75 | -88 | -88 |
| SS-RSRQNote2 | dB | -14.75 | -14.75 | -15.56 | -15.56 |
|  | dB | -1.75 | -1.75 | -3 | -3 |
| IoNote2 | dBm/95.04 MHz Note4 | -53.8 | -53.8 | -54.25 | -54.25 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRQ, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.7.2.2.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ -2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ +3.5dB to Nominal SS-RSRQ -3.5dB according to the requirements in clause 10.1.10.1.1.

The SS-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.1.2.

A.7.7.3 SS-SINR

#### A.7.7.3.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

##### A.7.7.3.1.1 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 10.1.13.1.1.

##### A.7.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.3.1.2-1. . The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.7.7.3.1.2-2 and Table A.7.7.3.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

Table A.7.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.3.1.2-2: SS-SINR Intra frequency test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN |  | **Freq2** | | **Freq2** | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 66 | | 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | | |
| DRX cycle configuration | ms | Not applicable | | | |
| TRS configuration |  | TRS.2.1 TDD | | | |
| TCI state |  | TCI.State.0 | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD |  | SR.3.1 TDD |  |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD |  |
| Dedicated RMSI CORESET Reference Channel |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 | | | |
| SSB configuration |  | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement |  | Not Applicable | | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void | | | | | |

Table A.7.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 3** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 9 |  | Rough | | Rough | |
| Note1 | dBm/15kHz Note4 | -105 | | -105 | |
| Note1 | dBm/SCS Note3 | -96 | | -96 | |
|  | dB | 4.54 | 2.66 | -3 | -3 |
| SSB\_RPNote2 | dBm/SCS Note4 | -91.46 | -93.34 | -99 | -99 |
| SS-SINR Note2 | dB | 0 | -3.2 | -4.76 | -4.76 |
|  | dB | 0 | -3.2 | -4.76 | -4.76 |
| IoNote2 | dBm/95.04 MHz Note4 | -59.2 | | -64 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-SINR, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.7.3.1.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3B to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.10.13.1.

#### A.7.7.3.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

##### A.7.7.3.2.1 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 Clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

##### A.7.7.3.2.2 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.7.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.7.7.3.2.2-2 and Table A.7.7.3.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.3.2.2-2: SS-SINR Inter frequency general test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN |  | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode |  | TDD | | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 66 | | 66 | | 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration |  | TRS.2.1 TDD | | | | | |
| TCI state |  | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |  |  |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void | | | | | | | |

**Table A.7.7.3.2.2-3: SS-SINR Inter frequency OTA related test parameters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
| Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | degrees | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 10 |  | Rough | | Rough | | Rough | |
| Note1 | dBm/15kHz Note4 | -105 | -105 | -105 | -105 | -105 | -105 |
| Note1 | dBm/SCS Note3 | -96 | -96 | -96 | -96 | -96 | -96 |
|  | dB | -0.5 | -0.5 | 11.0 | 11.0 | -3.0 | -3.0 |
| SSB\_RPNote2 | dBm/SCS Note4 | -96.5 | -96.5 | -85 | -85 | -99 | -99 |
| SS-SINRNote2 | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
|  | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
| IoNote2 | dBm/95.04 MHz Note4 | -69.3 | -69.3 | -55.4 | -55.4 | -65.24 | -65.24 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-SINR, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Void  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.7.7.3.2.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR +3dB to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.15.1.1.

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.1.2.

A.7.7.4 L1-RSRP measurement for beam reporting

#### A.7.7.4.1 SSB based L1-RSRP measurement

##### A.7.7.4.1.1 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 clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.7.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.7.7.4.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

##### A.7.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2.

Here 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.7.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | 1~2 |  | freq1 | freq1 |
| Duplex mode | 1~2 |  | TDD | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | SR.3.2 TDD |
| 2 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| 2 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| 2 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 | SSB.1 FR2 |
| 2 | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1~2 |  | SMTC.1 | SMTC.1 |
| reportConfigType | 1~2 |  | periodic | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 | 2 |
| L1-RSRP reporting period | 1~2 |  | slot320 | slot320 |
| Propagation condition | 1~2 |  | AWGN | AWGN |
| Antenna configuration | 1~2 |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

**Table A.7.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1, 2 | dBm/15kHz | -100 | | n.a. | |
|  | 1 | dBm/SSB SCS | -91 | | n.a. | |
| 2 | -88 | | n.a. | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| SSB\_RPNote1 | 1 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| 2 | -78 | -90 | As in Table B.2.4-2 | |
| IoNote1 | 1~2 | dBm/  95.04MHz | -51.57 | | SS-RSRP+28.98 | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| Note 1: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | |

##### A.7.7.4.1.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB0. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

For Test 2:

Absolute accuracy of SSB resource reported by UE in L1-RSRP report (SSB0 or SSB1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

Table A.7.7.4.1.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| SSB0 | SSB\_RP0 -δ + Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP0 +δ + Gmax |
| SSB1 | SSB\_RP1 -δ + Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP1 +δ + Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

#### A.7.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

##### A.7.7.4.2.1 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 clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.7.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.7.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

##### A.7.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2.

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.7.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | 1 |  | freq1 | freq1 |
| Duplex mode | 1 |  | TDD | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1 |  | SMTC.1 | SMTC.1 |
| CSI-RS | 1 |  | CSI-RS.3.2 TDD | CSI-RS.3.2 TDD |
| reportConfigType | 1 |  | periodic | periodic |
| reportQuantity | 1 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | 1 |  | 2 | 2 |
| L1-RSRP reporting period | 1 |  | slot80 | slot80 |
| Propagation condition | 1 |  | AWGN | AWGN |
| Antenna configuration | 1 |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

**Table A.7.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1~2 | dBm/15kHz | -100 | | n.a. | |
|  | 1~2 | dBm/SSB SCS | -91 | | n.a.  n.a. | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| CSI-RS-RSRPNote1 | 1~2 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| IoNote1 | 1~2 | dBm/  95.04MHz | -59.86 | | SS-RSRP+28.98 | |
|  | 1~2 | dB | -51.57 | -2 | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.7.7.4.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.20.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

For Test 2:

Absolute accuracy of CSI-RS resource reported by UE in L1-RSRP report (CSI-RS0 or CSI-RS1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.7.7.4.2.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| CSI-RS0 | CSI-RS \_RP0 -δ + Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP0 +δ + Gmax |
| CSI-RS1 | CSI-RS \_RP1 -δ + Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP1 +δ + Gmax |
| Note 1: CSI-RS\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

# A.8 E-UTRA standalone tests for NR RRM

*Editor notes: All NR RRM tests under E-UTRA standalone operations are included in this Annex. All EN-DC related NR RRM tests are in A.4 and A.5.*

## A.8.1 Void

## A.8.2 RRC\_IDLE state mobility

### A.8.2.1 Inter-RAT NR Cell re-selection

#### A.8.2.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

##### A.8.2.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in clause 4.2.2.5.6 in TS 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell as given in tables A.8.2.1.1.1-1, A.8.2.1.1.1-2, A.8.2.1.1.1-3 and A.8.2.1.1.1-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

Table A.8.2.1.1.1-1: Supported test configurations

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

**Table A.8.2.1.1.1-2: General test parameters for E-UTRA cell re-selection FR1 NR cell test case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE camps on cell 2 in the initial phase |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T1 end condition | Active cell |  |  | Cell1 | During T1 period the UE reselects to cell 1 |
|  | Neighbour cell |  |  | Cell2 |  |
| T3 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T3 |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| RF Channel Number | |  | 1, 2, 3, 4, 5, 6 | 1, 2 | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test |
| Time offset between cells | |  | 1, 4 | 3 ms | Asynchronous cells |
| 2, 5 | 3 μs | Synchronous cells |
| 3, 6 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2, 3, 4, 5, 6 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.8.2.1.1.1-3: Cell specific test parameters for NR cell 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | |
| T1 | T2 | T3 |
| TDD configuration |  | 1, 4 | N/A | | |
| 2, 5 | TDDConf.1.1 | | |
| 3, 6 | TDDConf.2.1 | | |
| PDSCH Reference measurement channel |  | 1, 4 | SR.1.1 FDD | | |
| 2, 5 | SR.1.1 TDD | | |
| 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel |  | 1, 4 | CR.1.1 FDD | | |
| 2, 5 | CR.1.1 TDD | | |
| 3, 6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel |  | 1, 4 | CCR.1.1 FDD | | |
| 2, 5 | CCR.1.1 TDD | | |
| 3, 6 | CCR.2.1 TDD | | |
| OCNG Patterns |  | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| SMTC configuration |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | | |
| 2, 5 | SSB.1 FR1 | | |
| 3, 6 | SSB.2 FR1 | | |
| Initial DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
| 3, 6 | -137 | | |
| Pcompensation | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Qhysts | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Qoffsets, n | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3, 4, 5, 6 | SS-RSRP | | |
|  | dB | 1, 4 | -4 | -infinity | 12 |
| 2, 5 |
| 3, 6 |
| Note2 | dBm/SCS | 1, 4 | -98 | | |
| 2, 5 | -98 | | |
| 3, 6 | -95 | | |
| Note2 | dBm/15 kHz | 1, 4 | -98 | | |
| 2, 5 |
| 3, 6 |
|  | dB | 1, 4 | -4 | -infinity | 12 |
| 2, 5 |
| 3, 6 |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -102 | -infinity | -86 |
| 2, 5 | -102 | -infinity | -86 |
| 3, 6 | -99 | -infinity | -83 |
| Io | dBm/9.36 MHz | 1, 4 | -68.60 | -70.05 | -57.78 |
| dBm/9.36 MHz | 2, 5 | -68.60 | -70.05 | -57.78 |
| dBm/38.16 MHz | 3, 6 | -62.50 | -63.95 | -51.69 |
| Treselection | s | 1, 2, 3, 4, 5, 6 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Threshx, highP | dB | 1, 2, 3, 4, 5, 6 | 48 | | |
| Threshserving, lowP | dB | 1, 2, 3, 4, 5, 6 | 44 | | |
| Threshx, lowP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: 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. | | | | | |

**Table A.8.2.1.1.1-4: Cell specific test parameters for E-UTRA cell 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | |
| **T1** | **T2** | **T3** |
| E-UTRA RF Channel number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | |
| Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 KHz | -84 | -84 | -84 |
|  | dB | 14 | 14 | 14 |
|  | dB | 14 | 14 | 14 |
| TreselectionEUTRAN | S | 0 | | |
| SnonintrasearchP | dB | 50 | | |
| Threshx, highP | dB | 48 | | |
| Threshserving, lowP | dB | 44 | | |
| Threshx, lowP | dB | 50 | | |
| Propagation Condition |  | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.8.2.1.1.2 Test Requirements

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

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

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

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

Where:

Thigher\_priority\_search See clause 4.2.2 in TS 36.133 [15]

Tevaluate, NR See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

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

Tevaluate, EUTRAN See Table 4.2.2.5-1 in clause 4.2.2.5

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## A.8.3 RRC\_CONNECTED state mobility

### A.8.3.1 Handover

#### A.8.3.1.1 E-UTRAN - NR handover in FR1

##### A.8.3.1.1.1 Test Purpose and Environment

This test shall verify the E-UTRAN to NR FR1 handover requirements as specified in clause 6.1.2.1 specified in clause 5.3.4 in TS 36.133 [15].

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN and Cell 2 is an inter-RAT NR neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [15] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.8.3.1.1-1. General test parameters are provided in Table A.8.3.1.1-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.8.3.1.1-3 and A.8.3.1.1-4 respectively.

Table A.8.3.1.1-1: Supported test configurations for E-UTRAN inter-RAT NR handover

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

**Table A.8.3.1.1-2: General test parameters for E-UTRAN inter-RAT NR handover**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | E-UTRAN cell |
| Neighbouring cell |  | Cell 2 | NR cell |
| Final condition | Active cell |  | Cell 2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | |  | RSRP |  |
| b2-Threshold1 | | dBm | -83 | Absolute E-UTRAN RSRP threshold for event B2 |
| b2-Threshold2NR | | dBm | As specified in Table A.8.3.1.1-4 | Absolute NR SS-RSRP threshold for event B2 |
| Hysteresis | | dB | 0 |  |
| TimeToTrigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | |  | 0 | As specified in Table 8.1.2.1-1 started before T2 starts [15] |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

Table A.8.3.1.1-3: Cell specific test parameters for E-UTRAN inter-RAT NR handover (Cell 1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 1 | | |
| T1 | T2 | T3 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode |  | 1, 2, 3 | FDD | | |
| 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | | |
| 4, 5, 6 | 53 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote4 |
| OCNG\_RBNote4 |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | 7 | 7 | 7 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | 7 | 7 | 7 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -91 | -91 | -91 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -91 | -91 | -91 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -62.43 | -62.43 | -62.43 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | | |

Table A.8.3.1.1-4: Cell specific test parameters E-UTRAN inter-RAT NR handover (Cell 2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 2 | | |
|  |  |  | T1 | T2 | T3 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode |  | 1, 4 | FDD | | |
|  |  | 2, 3, 5, 6 | TDD | | |
| TDD Configuration |  | 2, 5 | TDDConf.1.1 | | |
|  |  | 3, 6 | TDDConf.2.1 | | |
| BWchannel | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | | |
|  |  | 2, 5 | 10: NRB,c = 52 (TDD) | | |
|  |  | 3, 6 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement channel |  | 1, 4 | SR.1.1 FDD | | |
|  |  | 2, 5 | SR.1.1 TDD | | |
|  |  | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel |  | 1, 4 | CR.1.1 FDD | | |
|  |  | 2, 5 | CR.1.1 TDD | | |
|  |  | 3, 6 | CR.2.1 TDD | | |
| PRACH configuration |  |  | FR1 PRACH configuration 1 | | |
| OCNG patternNote1 |  | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | |
| SMTC configuration |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration |  | 1, 2, 4, 5 | SSB.1 FR1 | | |
|  |  | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold2NR | dBm | 1, 2, 4, 5 | -106 | | |
|  |  | 3, 6 | -103 | | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS |  |  |  | | |
| *Noc*Note2 | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| *Noc*Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | | |
|  |  | 3, 6 | -95 | | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -inifinity | 0 | 0 |
| Ês/IotNote3 | dB | 1, 2, 3, 4, 5, 6 | -inifinity | 0 | 0 |
| SS-RSRPNote3 | dBm/SCS | 1, 2, 4, 5 | -inifinity | -98 | -98 |
|  |  | 3, 6 | -inifinity | -95 | -95 |
| IoNote3 | dBm/9.36 MHz | 1, 2, 4, 5 | -70.05 | -67.04 | -67.04 |
|  | dBm/38.16 MHz | 3, 6 | -63.96 | -60.94 | -60.94 |
| Propagation condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.8.3.1.1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 112 ms from the beginning of time period T3.

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

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

RRC procedure delay = 50 ms and is specified in TS36.133.

Tinterrupt = 62 ms in the test; Tinterrupt is defined in TS36.133 clause 5.3.4.3.

## A.8.4 Measurement procedure

A.8.4.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay

#### A.8.4.1.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay in non-DRX

##### A.8.4.1.1.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.1.1-1 below. Test parameters and cell-specific parameters for the NR cell are provided in Tables A.8.4.1.1.1-2 and A.8.4.1.1.1-3 below, respectively. Cell-specific parameters for the E-UTRA cell are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1.

**Table A.8.4.1.1.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test**

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

**Table A.8.4.1.1.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One NR FR1 carrier frequencies is used. |
| Active cell |  | Config 1,2,3,4,5,6 | Cell 1 | | Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | Cell 2 | | Cell 2 is on NR RF channel number 1. |
| SSB configuration |  | Config 1,4 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 2,5 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 3,6 | SSB.2 FR1 | | As specified in clause A.3.10.1 |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | Applicable to both cells. |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Frame time offset between serving and neighbour cells | ms | Config 1,2,3,4 | 3 | 7 | Asynchronous cells.  The timing of Cell 2 relative to the timing of Cell 1. |
| μs | Config 5,6 | 3 | | Synchronous cells. |
| SFN offset between serving and neighbour cells |  | Config 1,2,3,4,5,6 | 0 | 1 | SFN of Cell 2 relative to SFN of Cell 1. |
| T1 | s | Config 1,2,3,4,5,6 | 1 | |  |

**Table A.8.4.1.1.1-3: Cell specific test parameters for Cell 2 in inter-RAT SFTD measurement delay test**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 2** |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 |
| Duplex mode |  | Config 1,4 | FDD |
| Config 2,3,5,6 | TDD |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 |
| Config 2,5 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| OCNG Pattern defined in A.3.2.1.1 |  | Config 1,2,3,4,5,6 | OP.1 |
| SMTC configuration |  | Config 1,2,3,4,5,6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 |
| Config 3,6 | 30 |
| EPRE ratio of PSS to SSS | dB | Config 1,2,3,4,5,6 | 0 |
| EPRE ratio of PBCH DMRS to SSS | dB |
| EPRE ratio of PBCH to PBCH DMRS | dB |
| EPRE ratio of OCNG DMRS to SSS Note 1 | dB |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | dB |
| Noc Note2 | dBm/15kHz |  | -98 |
| Noc Note2 | dBm/SCS | Config 1,2,4,5 | -98 |
| Config 3,6 | -95 |
| SS-RSRP Note 3, 4 | dBm/SCS | Config 1,2,4,5 | -94 |
| Config 3,6 | -91 |
| Ês/Iot | dB | Config 1,2,3,4,5,6 | 4 |
| Ês/Noc | dB | Config 1,2,3,4,5,6 | 4 |
| Io Note 3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 |
| dBm/38.16MHz | Config 3,6 | -58.50 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *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: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | |

##### A.8.4.1.1.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at TRRC\_procedure\_delay + Tmeasure\_SFTD1 after the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTIDCCH longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

#### A.8.4.1.2 E-UTRA – NR Inter-RAT SFTD Measurement Delay in DRX

##### A.8.4.1.2.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.2.1-1 below. Test parameters are provided in Tables A.8.4.1.2.1-2 below. Cell-specific parameters for the E-UTRA and NR cells are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1, and Table A.8.4.1.1.1-3 in clause A.8.4.1.1.1, respectively.

**Table A.8.4.1.2.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX**

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

**Table A.8.4.1.2.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One NR FR1 carrier frequencies is used. |
| Active cell |  | Config 1,2,3,4,5,6 | Cell 1 | | Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | Cell 2 | | Cell 2 is on NR RF channel number 1. |
| SSB configuration |  | Config 1,4 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 2,5 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 3,6 | SSB.2 FR1 | | As specified in clause A.3.10.1 |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | Applicable to both cells. |
| DRX |  | Config 1,2,3,4,5,6 | DRX.4 | | DRX configuration as specified in clause A.3.3.4 |
| Frame time offset between serving and neighbour cells | ms | Config 1,2,4,5 | 3 | 7 | Asynchronous cells.  The timing of Cell 2 relative to the timing of Cell 1. |
| μs | Config 3,6 | 3 | | Synchronous cells. |
| SFN offset between serving and neighbour cells |  | Config 1,2,3,4,5,6 | 0 | 1 | SFN of Cell 2 relative to SFN of Cell 1. |
| T1 | s | Config 1,2,3,4,5,6 | 1 | |  |

##### A.8.4.1.2.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at the earliest DRX activity time following upon TRRC\_procedure\_delay + Tmeasure\_SFTD1 from the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTIDCCH longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

### A.8.4.2 E-UTRA – NR Inter-RAT Measurements

#### A.8.4.2.1 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

##### A.8.4.2.1.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.1.1-1, A.8.4.2.1.1-2, A.8.4.2.1.1-3 and A.8.4.2.1.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] 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.

Table A.8.4.2.1.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

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

Table A.8.4.2.1.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | One FR1 NR carrier frequency is used. |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRA cell 1 (PCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2, 3, 4, 5, 6 | 0 | 4 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2, 3, 4, 5, 6 | 39 | 19 | As specified in TS 36.331 [16]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | |  |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | 1, 4 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2, 3, 5, 6 | 3μs | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 1 | 1 |  |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.1.1-3  Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.1.1-4 | | | | | |

Table A.8.4.2.1.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 1 | |
| T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -79 | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
| NocNote4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| Ês/IotNote5 | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH\_RPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| IoNote5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -59.13+10log (NRB,c /50) | -59.13+10log (NRB,c /50) |
| Propagation Condition Note6 |  | 1, 2, 3, 4, 5, 6 | ETU70 | |
| Antenna Configuration and Correlation Matrix Note6 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

Table A.8.4.2.1.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | |
| T1 | T2 |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 4 | FDD | |
| 2, 3, 5, 6 | TDD | |
| TDD configuration |  | 2, 5 | TDDConf.1.1 | |
| 3, 6 | TDDConf.2.1 | |
| BWchannel | MHz | 1, 2, 4, 5 | 10: NRB,c = 52 | |
| 3, 6 | 40: NRB,c = 106 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |  | 1, 4 | SMTC.2 | |
| 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| 3, 6 | -98 | |
| EPRE ratio of PSS to SSS |  | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| 3, 6 | -Infinity | -88 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| dBm/38.16MHz | 3, 6 | -63.95 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | TDL-C 300ns 100Hz | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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. | | | | |

##### A.8.4.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

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

#### A.8.4.2.2 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

##### A.8.4.2.2.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.2.1-1, A.8.4.2.2.1-2, A.8.4.2.2.1-3 and A.8.4.2.2.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.2.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] 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.

Table A.8.4.2.2.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

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

Table A.8.4.2.2.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | | | Comment |
| Test 1 | Test 2 | | Test 3 | Test 4 | |
| E-UTRA RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | | | | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | | | | | One FR1 NR carrier frequency is used. |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRA cell 1 (PCell) | | | | | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR cell 2 | | | | | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2, 3, 4, 5, 6 | 0 | | | 4 | | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2, 3, 4, 5, 6 | 39 | | | 19 | | | As specified in TS 36.331 [16]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | | | | | | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | | | | | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | | | | | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | | | | | |  |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | | | | | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | | | | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | DRX.9 | DRX.12 | | DRX.9 | DRX.12 | | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | 1, 4 | 3ms | | | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2, 3, 5, 6 | 3μs | | | | | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | | | | | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 2 | | 11 | 2 | | 11 |  |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.2.1-3  Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.2.1-4 | | | | | | | | | |

Table A.8.4.2.2.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 1 | |
| T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
| NocNote4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| Ês/IotNote5 | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH\_RPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| IoNote5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -59.13+10log (NRB,c /50) | -59.13+10log (NRB,c /50) |
| Propagation Condition Note6 |  | 1, 2, 3, 4, 5, 6 | ETU70 | |
| Antenna Configuration and Correlation Matrix Note6 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

Table A.8.4.2.2.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | |
| T1 | T2 |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 4 | FDD | |
| 2, 3, 5, 6 | TDD | |
| TDD configuration |  | 2, 5 | TDDConf.1.1 | |
| 3, 6 | TDDConf.2.1 | |
| BWchannel | MHz | 1, 2, 4, 5 | 10: NRB,c = 52 | |
| 3, 6 | 40: NRB,c = 106 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |  | 1, 4 | SMTC.2 | |
| 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| 3, 6 | -98 | |
| EPRE ratio of PSS to SSS |  | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| 3, 6 | -Infinity | -88 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| dBm/38.16MHz | 3, 6 | -63.95 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | TDL-C 300ns 100Hz | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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. | | | | |

##### A.8.4.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

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

#### A.8.4.2.3 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

##### A.8.4.2.3.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.3.1-1, A.8.4.2.3.1-2, A.8.4.2.3.1-3 and A.8.4.2.3.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. 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.

Table A.8.4.2.3.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

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

Table A.8.4.2.3.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | One FR1 NR carrier frequency is used. |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRA cell 1 (PCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2, 3, 4, 5, 6 | 0 | 4 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2, 3, 4, 5, 6 | 39 | 19 | As specified in TS 36.331 [16]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | |  |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | 1, 4 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
|  | 2, 3, 5, 6 | 3μs | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 2 | 1 |  |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.3.1-3  Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.3.1-4 | | | | | |

Table A.8.4.2.3.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 1 | |
| T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
| NocNote4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| Ês/IotNote5 | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH\_RPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| IoNote5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -59.13+10log (NRB,c /50) | -59.13+10log (NRB,c /50) |
| Propagation Condition Note6 |  | 1, 2, 3, 4, 5, 6 | ETU70 | |
| Antenna Configuration and Correlation Matrix Note6 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

Table A.8.4.2.3.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | |
| T1 | T2 |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 4 | FDD | |
| 2, 3, 5, 6 | TDD | |
| TDD configuration |  | 2, 5 | TDDConf.1.1 | |
| 3, 6 | TDDConf.2.1 | |
| BWchannel | MHz | 1, 2, 4, 5 | 10: NRB,c = 52 | |
| 3, 6 | 40: NRB,c = 106 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |  | 1, 4 | SMTC.2 | |
| 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| 3, 6 | -98 | |
| EPRE ratio of PSS to SSS |  | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| 3, 6 | -Infinity | -88 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| dBm/38.16MHz | 3, 6 | -63.95 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | TDL-C 300ns 100Hz | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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. | | | | |

##### A.8.4.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

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

#### A.8.4.2.4 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

##### A.8.4.2.4.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.4.1-1, A.8.4.2.4.1-2, A.8.4.2.4.1-3 and A.8.4.2.4.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.4.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. 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.

Table A.8.4.2.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

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

Table A.8.4.2.4.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | | | Comment |
| Test 1 | Test 2 | | Test 3 | Test 4 | |
| E-UTRA RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | | | | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | | | | | | One FR1 NR carrier frequency is used. |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRA cell 1 (PCell) | | | | | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR cell 2 | | | | | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2, 3, 4, 5, 6 | 0 | | | 4 | | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2, 3, 4, 5, 6 | 39 | | | 19 | | | As specified in TS 36.331 [16]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | | | | | | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | | | | | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | | | | | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | | | | | |  |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | | | | | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | | | | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | DRX.9 | DRX.12 | | DRX.9 | DRX.12 | | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | 1, 4 | 3ms | | | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2, 3, 5, 6 | 3μs | | | | | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | | | | | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 2 | | 13 | 2 | | 13 |  |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.4.1-3  Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.4.1-4 | | | | | | | | | |

Table A.8.4.2.4.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 1 | |
| T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
| 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
| 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote2 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
| 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
| NocNote4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| Ês/IotNote5 | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH\_RPNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| IoNote5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -59.13+10log (NRB,c /50) | -59.13+10log (NRB,c /50) |
| Propagation Condition Note6 |  | 1, 2, 3, 4, 5, 6 | ETU70 | |
| Antenna Configuration and Correlation Matrix Note6 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

Table A.8.4.2.4.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | |
| T1 | T2 |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode |  | 1, 4 | FDD | |
| 2, 3, 5, 6 | TDD | |
| TDD configuration |  | 2, 5 | TDDConf.1.1 | |
| 3, 6 | TDDConf.2.1 | |
| BWchannel | MHz | 1, 2, 4, 5 | 10: NRB,c = 52 | |
| 3, 6 | 40: NRB,c = 106 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |  | 1, 4 | SMTC.2 | |
| 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| 3, 6 | -98 | |
| EPRE ratio of PSS to SSS |  | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |
| EPRE ratio of PBCH to PBCH DMRS |  |
| EPRE ratio of PDCCH DMRS to SSS |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |
| EPRE ratio of PDSCH DMRS to SSS |  |
| EPRE ratio of PDSCH to PDSCH |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| 3, 6 | -Infinity | -88 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
|  | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| dBm/38.16MHz | 3, 6 | -63.95 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | TDL-C 300ns 100Hz | |
| Antenna Configuration and Correlation Matrix |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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. | | | | |

##### A.8.4.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

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

#### A.8.4.2.5 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used

##### A.8.4.2.5.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.5.1-1, A.8.4.2.5.1-2 and A.8.4.2.5.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.5.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] 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 timing information of NR cell 2.

Table A.8.4.2.5.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.8.4.2.5.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | 1, 2 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2 | 1 | | One FR2 NR carrier frequency is used. |
| Active cell |  | 1, 2 | E-UTRA cell 1 (PCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2. |
| Neighbour cell |  | 1, 2 | NR cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2 | 0 | 4 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2 | 39 | 19 | As specified in TS 36.331 [16]. |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16] |
| Hysteresis | dB | 1, 2 | 0 | |  |
| CP length |  | 1, 2 | Normal | |  |
| TimeToTrigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2 | 3μs | | Synchronous cells. |
| T1 | s | 1, 2 | 10 | |  |
| T2 | s | 1, 2 | 6 | 3 |  |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.5.1-3 | | | | | |

Table A.8.4.2.5.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 2 | |
| T1 | T2 |
| AoA setup defined in A.3.15.2.1 | |  | 1, 2 | Setup 2a | |
| Assumption for UE beamsNote 5 | |  | 1, 2 | Rough | |
| NR RF Channel Number | |  | 1, 2 | 1 | |
| Duplex mode | |  | 1, 2 | TDD | |
| TDD configuration | |  | 1, 2 | TDDConf.3.1 | |
| BWchannel | | MHz | 1, 2 | 100: NRB,c = 24 | |
| OCNG patterns defined in A.3.2.1.3 | |  | 1, 2 | OP.3 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | 1 | SMTC.2 | |
| 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | 1, 2 | -112 | |
| EPRE ratio of PSS to SSS | |  | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Ês | | dBm/SCS | 1, 2 | -Infinity | -80.6 |
| SSB-RP Note 3 | | dBm/SCS | 1, 2 | -Infinity | -80.6 |
| BB Note 6 | | dB | 1, 2 | -Infinity | 8.3 |
| IoNote3 | | dBm/95.04MHz | 1, 2 | -Infinity | -56.0 |
| Propagation Condition | |  | 1, 2 | AWGN | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | |

##### A.8.4.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

Table A.8.4.2.5.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

|  |  |  |
| --- | --- | --- |
| Test case | Measurement reporting delay (ms) | |
| Test 1: D1 ms | Test 2: D2 ms |
| UE power class 3 | 3200 | 1600 |

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.8.4.2.6 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used

##### A.8.4.2.6.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.6.1-1, A.8.4.2.6.1-2 and A.8.4.2.6.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.6.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.6.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] 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 timing information of NR cell 2.

Table A.8.4.2.6.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.8.4.2.6.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | | | Comment |
| Test 1 | Test 2 | | Test 3 | Test 4 | |
| E-UTRA RF Channel Number |  | 1, 2 | 1 | | | | | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2 | 1 | | | | | | One FR2 NR carrier frequency is used. |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRA cell 1 (PCell) | | | | | | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR cell 2 | | | | | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2, 3, 4, 5, 6 | 0 | | | 4 | | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2, 3, 4, 5, 6 | 39 | | | 19 | | | As specified in TS 36.331 [16]. |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | | | | | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | | | | | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | | | | | |  |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | | | | | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | | | | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | DRX.9 | DRX.12 | | DRX.9 | DRX.12 | | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | 1 | 3ms | | | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2 | 3μs | | | | | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | | | | | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 6 | | 83 | 6 | | 83 |  |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.6.1-3 | | | | | | | | | |

Table A.8.4.2.6.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 2** | |
| **T1** | **T2** |
| AoA setup defined in A.3.15.1 | |  | 1, 2 | Setup 1 | |
| Assumption for UE beamsNote 5 | |  | 1, 2 | Rough | |
| NR RF Channel Number | |  | 1, 2 | 1 | |
| Duplex mode | |  | 1, 2 | TDD | |
| TDD configuration | |  | 1, 2 | TDDConf.3.1 | |
| BWchannel | | MHz | 1, 2 | 100: NRB,c = 66 | |
| OCNG patterns defined in A.3.2.1.1 (OP.1) | |  | 1, 2 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | 1 | SMTC.2 | |
| 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | 1, 2 | -106 | |
| EPRE ratio of PSS to SSS | |  | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz | 1, 2 | -104.7 | |
| Note2 | | dBm/SCS | 1, 2 | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS | 1, 2 | -Infinity | -87.7 |
|  | | dB | 1, 2 | -Infinity | 8 |
|  | | dB | 1, 2 | -Infinity | 8 |
| IoNote3 | | dBm/95.04MHz | 1, 2 | -66.7 | -58.0 |
| Propagation Condition | |  | 1, 2 | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 3: 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: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.8.4.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

Table A.8.4.2.6.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test case | Measurement reporting delay (ms) | | | |
| Test 1: D1 ms | Test 2: D2 ms | Test 3: D3 ms | Test 4: D4 ms |
| UE power class 3 | 4800 | 51200 | 4800 | 51200 |

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.8.4.2.7 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used

##### A.8.4.2.7.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.7.1-1, A.8.4.2.7.1-2 and A.8.4.2.7.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.7.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.7.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. 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.

Table A.8.4.2.7.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in non-DRX

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.8.4.2.7.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Numbers |  | 1, 2 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Numbers |  | 1, 2 | 1 | | One FR2 NR carrier frequency is used. |
| Active cell |  | 1, 2 | E-UTRA cell 1 (PCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2. |
| Neighbour cell |  | 1, 2 | NR cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2 | 0 | 4 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2 | 39 | 19 | As specified in TS 36.331 [16]. |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16] |
| Hysteresis | dB | 1, 2 | 0 | |  |
| CP length |  | 1, 2 | Normal | |  |
| TimeToTrigger | s | 1, 2 | 0 | |  |
| Filter coefficient |  | 1, 2 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells |  | 1 | 3ms | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2 | 3μs | | Synchronous cells. |
| T1 | s | 1, 2 | 5 | |  |
| T2 | s | 1, 2 | 5 | 3 |  |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.7.1-3 | | | | | |

Table A.8.4.2.7.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 2** | |
| **T1** | **T2** |
| AoA setup defined in A.3.15.1 | |  | 1, 2 | Setup 1 | |
| Assumption for UE beamsNote 5 | |  | 1, 2 | Rough | |
| NR RF Channel Number | |  | 1, 2 | 1 | |
| Duplex mode | |  | 1, 2 | TDD | |
| TDD configuration | |  | 1, 2 | TDDConf.3.1 | |
| BWchannel | | MHz | 1, 2 | 100: NRB,c = 66 | |
| OCNG patterns defined in A.3.2.1.1 | |  | 1, 2 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | 1 | SMTC.2 | |
| 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | 1, 2 | -106 | |
| EPRE ratio of PSS to SSS | |  | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz | 1, 2 | -104.7 | |
| Note2 | | dBm/SCS | 1, 2 | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS | 1, 2 | -Infinity | -87.7 |
|  | | dB | 1, 2 | -Infinity | 8 |
|  | | dB | 1, 2 | -Infinity | 8 |
| IoNote3 | | dBm/95.04MHz | 1, 2 | -66.7 | -58.0 |
| Propagation Condition | |  | 1, 2 | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 3: 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: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.8.4.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

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

Table A.8.4.2.7.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

|  |  |  |
| --- | --- | --- |
| Test case | Measurement reporting delay (ms) | |
| Test 1: D1 ms | Test 2: D2 ms |
| UE power class 3 | 4160 | 2080 |

#### A.8.4.2.8 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is used

##### A.8.4.2.8.1 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 NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.8.1-1, A.8.4.2.8.1-2 and A.8.4.2.8.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.8.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.8.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. 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.

Table A.8.4.2.8.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in DRX

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.8.4.2.8.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | 1, 2 | 1 | | | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2 | 1 | | | | One FR2 NR carrier frequency is used. |
| Active cell |  | 1, 2 | E-UTRA cell 1 (PCell) | | | | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2. |
| Neighbour cell |  | 1, 2 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2 | 0 | | 4 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2 | 39 | | 19 | | As specified in TS 36.331 [16]. |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | | | | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16] |
| Hysteresis | dB | 1, 2 | 0 | | | |  |
| CP length |  | 1, 2 | Normal | | | |  |
| TimeToTrigger | s | 1, 2 | 0 | | | |  |
| Filter coefficient |  | 1, 2 | 0 | | | | L3 filtering is not used |
| DRX |  |  | DRX.9 | DRX.12 | DRX.9 | DRX.12 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | 1 | 3ms | | | | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  | 2 | 3μs | | | | Synchronous cells. |
| T1 | s | 1, 2 | 5 | | | |  |
| T2 | s | 1, 2 | 7 | 70 | 7 | 70 |  |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.8.1-3 | | | | | | | |

Table A.8.4.2.8.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 2** | |
| **T1** | **T2** |
| AoA setup defined in A.3.15.1 | |  | 1, 2 | Setup 1 | |
| Assumption for UE beamsNote 5 | |  | 1, 2 | Rough | |
| NR RF Channel Number | |  | 1, 2 | 1 | |
| Duplex mode | |  | 1, 2 | TDD | |
| TDD configuration | |  | 1, 2 | TDDConf.3.1 | |
| BWchannel | | MHz | 1, 2 | 100: NRB,c = 66 | |
| OCNG patterns defined in A.3.2.1.1 | |  | 1, 2 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | 1 | SMTC.2 | |
| 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | 1, 2 | -106 | |
| EPRE ratio of PSS to SSS | |  | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |
| Note2 | | dBm/15kHz | 1, 2 | -104.7 | |
| Note2 | | dBm/SCS | 1, 2 | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS | 1, 2 | -Infinity | -87.7 |
|  | | dB | 1, 2 | -Infinity | 8 |
|  | | dB | 1, 2 | -Infinity | 8 |
| IoNote3 | | dBm/95.04MHz | 1, 2 | -66.7 | -58.0 |
| Propagation Condition | |  | 1, 2 | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 3: 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: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.8.4.2.8.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

Table A.8.4.2.8.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test case | Measurement reporting delay (ms) | | | |
| Test 1: D1 ms | Test 2: D2 ms | Test 3: D3 ms | Test 4: D4 ms |
| UE power class 3 | 6240 | 66560 | 6240 | 66560 |

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.8.5 Measurement performance

A.8.5.1 SFTD accuracy

#### A.8.5.1.1 SFTD accuracy

##### A.8.5.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for inter-RAT FR1 SFTD measurements.

##### A.8.5.1.1.2 Test Environment

Supported test configurations are shown in Table A.8.5.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is inter-RAT NR FR1 target cell. The test parameters of cell 1 are given in clause A.8.5.1.1.2-2. The test parameters of cell 2 are given in Table A.8.5.1.1.2-3. The SFTD between PCell and target cell shall be set by the test equipment to one of the time differences in Table A.8.5.1.1.2-4.

**Table A.8.5.1.1.2-1: Supported test configurations for SFTD accuracy**

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

Table A.8.5.1.1.2-2: Test parameters for SFTD accuracy (Cell 1)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| E-UTRA RF Channel Number |  | 1 |
| Duplex mode |  | FDD or TDD |
| TDD special subframe configurationNote1 |  | 6 |
| TDD uplink-downlink configurationNote1 |  | 1 |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD |
| PBCH\_RA | dB | 0 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote3 | dB |
| OCNG\_RBNote3 | dB |
| NocNote4 | dBm/15 kHz | -104 |
| Ês/Noc | dB | -3 |
| Ês/Iot | dB | -3 |
| RSRP Note5 | dBm/15 kHz | -107 |
| SCH\_RP Note5 | dBm/15 kHz | -107 |
| Io Note5 | dBm/Ch BW | -74.45  +10log  (NRB,c /50) |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 1x2 |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

Table A.8.5.1.1.2-3: Test parameters for SFTD accuracy (Cell 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 |
| SSB GSCN | | 1~6 |  | freq1 |
| Duplex mode | | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| RMC CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.1 FR1 |
| 2,5 | SSB.1 FR1 |
| 3,6 | SSB.2 FR1 |
| SMTC configuration | | 1~6 |  | SMTC.1 |
| DL BWP configuration | | 1~6 |  | DLBWP.1.1 |
| UL BWP configuration | | 1~6 |  | ULBWP.1.1 |
| OCNG Patterns | | 1~6 |  | OP.1 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~6 | dBm/15kHz | -104 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -104 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -101 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
|  | | 1~6 | dB | -3 |
|  | | 1~6 | dB | -3 |
| SS-RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SCS | -107 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -104 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -74.28 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | dBm/38.16 MHz | -68.18 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Propagation condition | | 1~6 |  | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  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: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | |

Table A.8.5.1.1.2-4: Timing offsets for SFTD accuracy test

|  |  |  |
| --- | --- | --- |
| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

##### A.8.5.1.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and inter-RAT NR target cell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

### A.8.5.2 E-UTRA – NR Inter-RAT Measurement Performance requirements

#### A.8.5.2.1 SS-RSRP

##### A.8.5.2.1.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

A.8.5.2.1.1.1 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 clause 9.11.1 in TS 36.133 [15] for inter-RAT FR1 SS-RSRP measurements.

A.8.5.2.1.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.1.1.2-2.

**Table A.8.5.2.1.1.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations**

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

Table A.8.5.2.1.1.2-2: SS-RSRP inter-RAT test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | |
| Cell 2 | | Cell 2 | |
| SSB ARFCN | | |  | freq1 | | freq1 | |
| Duplex mode | | Config 1,4 |  | FDD | | | |
| Config 2,3,5,6 | TDD | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | |
| Config 2,5 | TDDConf.1.1 | | | |
| Config 3,6 | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | - | | - | |
| Config 2,5 |
| Config 3,6 |
| RMSI CORESET Reference Channel | | Config 1,4 |  | - | | - | |
| Config 2,5 |
| Config 3,6 |
| Dedicated CORESET Reference Channel | | Config 1,4 |  | - | | - | |
| Config 2,5 |
| Config 3,6 |
| OCNG Patterns | | |  | OP.1 | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | |
| SMTC configruation | | |  | SMTC.1 | | | |
| SSB configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | | |
| Config 3,6 | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,3,4,5,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -94.65 | | -117 | |
| NR\_FDD\_FR1\_B | -116.5 | |
| NR\_TDD\_FR1\_C | -116 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -115.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -115 | |
| NR\_FDD\_FR1\_G | -114 | |
| NR\_FDD\_FR1\_H | -113.5 | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -94.65 | | Same as Noc for 15kHz | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -91.65 | | -114 | |
| NR\_FDD\_FR1\_B | -113.5 | |
| NR\_TDD\_FR1\_C | -113 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -112.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -112 | |
| NR\_FDD\_FR1\_G | -111 | |
| NR\_FDD\_FR1\_H | -110.5 | |
|  | | | dB | 10 | | -4 | |
|  | | | dB | 10 | | -4 | |
| SS-RSRPNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -84.65 | | -121 | |
| NR\_FDD\_FR1\_B | -120.5 | |
| NR\_TDD\_FR1\_C | -120 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -119.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -119 | |
| NR\_FDD\_FR1\_G | -118 | |
| NR\_FDD\_FR1\_H | -117.5 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -81.65 | | -118 | |
| NR\_FDD\_FR1\_B | -117.5 | |
| NR\_TDD\_FR1\_C | -117 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -116.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -116 | |
| NR\_FDD\_FR1\_G | -115 | |
| NR\_FDD\_FR1\_H | -114.5 | |
| IoNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -56.28 | | -87.76 | |
| NR\_FDD\_FR1\_B | -87.26 | |
| NR\_TDD\_FR1\_C | -86.76 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -86.26 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -85.76 | |
| NR\_FDD\_FR1\_G | -84.76 | |
| NR\_FDD\_FR1\_H | -84.26 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -50.19 | | -84.76 | |
| NR\_FDD\_FR1\_B | -84.26 | |
| NR\_TDD\_FR1\_C | -83.76 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -83.26 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -82.76 | |
| NR\_FDD\_FR1\_G | -81.76 | |
| NR\_FDD\_FR1\_H | -81.26 | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |

A.8.5.2.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

##### A.8.5.2.1.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

###### A.8.5.2.1.2.1 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 clause 9.11.1 in TS 36.133 [15] for inter-RAT FR2 SS-RSRP measurements.

###### A.8.5.2.1.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.2.2-1. In this test case there are two cells on different carriers. Absolute accuracy requirements of SS-RSRP inter-RAT measurement are tested by using test setup in Table A.8.5.2.1.2.2-2 and Table A.8.5.2.1.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.8.5.2.1.2.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.8.5.2.1.2.2-2: SS-RSRP Inter-RAT general test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Cell 2 | Cell 2 |
| SSB ARFCN |  | Freq1 | freq1 |
| Duplex mode |  | TDD | TDD |
| TDD configuration |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Downlink initial BWP configuration |  | DLBWP.0.1 | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | |
| DRX cycle configuration | ms | Not applicable | |
| PDSCH Reference measurement channel |  | - | - |
| RMSI CORESET Reference Channel |  | - | - |
| OCNG Patterns |  | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 | SMTC.1 |
| SSB configuraiton |  | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
|  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void.  Note 3: Void.  Note 4: Void. | | | |

Table A.8.5.2.1.2.2-3: SS-RSRP Inter-RAT OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Cell 2 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1 |
| Assumption for UE beamsNote 10 |  | Rough | Rough |
| Note1 | dBm/15kHz Note4 | -105 | N/A |
| Note1 | dBm/SCS  Note4 | -96 | N/A |
| *Es* | dBm/SCS  Note4 |  | (Table B.2.3-2 Rx Beam Peak +1dB)  (Note 7) |
|  | dB | 11 | N/A |
| SSB\_RPNote2 | dBm/SCS Note4 | -85 | (Table B.2.3-2 Rx Beam Peak +1dB)  (Note 7) |
| BB Note 2, Note 9 | dB | 9.97 | -3.81 |
| IoNote2 | dBm/95.04 MHz Note4 | -55.65 | (Table B.2.3-2 Rx Beam Peak +30dB)  (Note 8) |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.  Note 5: Void  Note 6: Void  Note 7: SSB\_RP is applied at 1dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 8: Io is applied at 10log10(792)dB+1dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 9: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | |

###### A.8.5.2.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

#### A.8.5.2.2 SS-RSRQ

##### A.8.5.2.2.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

A.8.5.2.2.1.1 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 9.11.2 in TS 36.133 [15] for inter-RAT FR1 SS-RSRQ measurements.

A.8.5.2.2.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.2.1.2-2.

Table A.8.5.2.2.1.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations

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

Table A.8.5.2.2.1.2-2: SS-RSRQ inter-RAT test parameters

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
| Cell 2 | | Cell 2 | | Cell 2 | |
| SSB ARFCN | | |  | freq1 | | freq1 | | freq1 | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | |
| Config 2,3,5,6 | TDD | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | - | | - | | - | |
| Config 2,5 |
| Config 3,6 |
| RMSI CORESET Reference Channel | | Config 1,4 |  | - | | - | | - | |
| Config 2,5 |
| Config 3,6 |
| Dedicated CORESET Reference Channel | | Config 1,4 |  | - | | - | | - | |
| Config 2,5 |
| Config 3,6 |
| OCNG Patterns | | |  | OP.1 | | | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | | | |
| SMTC configruation | | |  | SMTC.1 | | | | | |
| SSB configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | | | |
| Config 3,6 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -80.18 | | -106 | | -116 | |
| NR\_FDD\_FR1\_B | -115.5 | |
| NR\_TDD\_FR1\_C | -115 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | |
| NR\_FDD\_FR1\_G | -113 | |
| NR\_FDD\_FR1\_H | -112.5 | |
|  | Config 3,6 | |  | -86.27 | | -113 | | Same as Noc for Config 1,2,4,5 | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -80.18 | | -106 | | Same as Noc for 15kHz | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -83.27 | | -110 | | -113 | |
| NR\_FDD\_FR1\_B | -112.5 | |
| NR\_TDD\_FR1\_C | -112 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -111.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -111 | |
| NR\_FDD\_FR1\_G | -110 | |
| NR\_FDD\_FR1\_H | -109.5 | |
|  | | | dB | -1.75 | | -1.75 | | -1.75 | |
|  | | | dB | -1.75 | | -1.75 | | -1.75 | |
| SS-RSRPNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -81.93 | | -107.75 | | -117.75 | |
| NR\_FDD\_FR1\_B | -117.25 | |
| NR\_TDD\_FR1\_C | -116.75 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -116.25 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -115.75 | |
| NR\_FDD\_FR1\_G | -114.75 | |
| NR\_FDD\_FR1\_H | -114.25 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -85.02 | | -111.75 | | -114.75 | |
| NR\_FDD\_FR1\_B | -114.25 | |
| NR\_TDD\_FR1\_C | -113.75 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -113.25 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -112.75 | |
| NR\_FDD\_FR1\_G | -111.75 | |
| NR\_FDD\_FR1\_H | -111.25 | |
| SS-RSRQ Note3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dB | -14.77 | | -40.59 | | -14.76 | |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -50 | | -75.83 | | -85.83 | |
| NR\_FDD\_FR1\_B | -85.33 | |
| NR\_TDD\_FR1\_C | -84.83 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -84.33 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -83.83 | |
| NR\_FDD\_FR1\_G | -82.83 | |
| NR\_FDD\_FR1\_H | -82.33 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -50 | | -76.73 | | -79.73 | |
| NR\_FDD\_FR1\_B | -79.23 | |
| NR\_TDD\_FR1\_C | -78.73 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -78.23 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -77.73 | |
| NR\_FDD\_FR1\_G | -76.73 | |
| NR\_FDD\_FR1\_H | -76.53 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | |

A.8.5.2.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

##### A.8.5.2.2.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

###### A.8.5.2.2.2.1 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 9.11.2 in TS 36.133 [15] for inter-RAT FR2 SS-RSRQ measurements.

###### A.8.5.2.2.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.2.2-1. In this test case there are two cells on different carriers. Absolute accuracy requirements of SS-RSRQ inter-RAT measurement are tested by using test setup in Table A.8.5.2.2.2.2-2 and Table A.8.5.2.2.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.8.5.2.2.2.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.8.5.2.2.2.2-2: SS-RSRQ Inter-RAT general test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Cell 2 | Cell 2 |
| SSB ARFCN |  | Freq1 | freq1 |
| Duplex mode |  | TDD | TDD |
| TDD configuration |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Downlink initial BWP configuration |  | DLBWP.0.1 | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | |
| DRX cycle configuration | ms | Not applicable | |
| PDSCH Reference measurement channel |  | - | - |
| RMSI CORESET Reference Channel |  | - | - |
| OCNG Patterns |  | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 | SMTC.1 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
|  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void.  Note 3: Void.  Note 4: Void. | | | |

Table A.8.5.2.2.2.2-3: SS-RSRQ Inter-RAT OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Cell 2 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1 |
| Assumption for UE beamsNote 10 |  | Rough | Rough |
| Note1 | dBm/15kHz Note4 | -104.7 | (Table B.2.3-2 Rx Beam Peak -5dB)  (Note 7) |
| Note1 | dBm/SCS Note4 | -95.7 | (Table B.2.3-2 Rx Beam Peak +4dB)  (Note 7) |
|  | dB | -0.5 | -1.75 |
| SSB\_RPNote2 | dBm/SCS Note4 | -96.2 | (Table B.2.3-2 Rx Beam Peak +2.25dB)  (Note 8) |
| SS-RSRQNote2 | dB | -3.27 | -14.82 |
| Note2 | dB | -0.5 | -1.75 |
| IoNote2 | dBm/95.04 MHz Note4 | -63.95 | (Table B.2.3-2 Rx Beam Peak +35.22dB)  (Note 9) |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, SS-RSRQ, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.  Note 5: Void  Note 6: Void  Note 7: Noc for SCS 15kHz is applied at -10log10(8)+4dB above the minimum level specified in Table B.2.3-2 for beam peak. Noc for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 8: SSB\_RP is applied at 2.25dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 9: Io is applied at 10log10(792)+6.22dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | |

###### A.8.5.2.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

In this test case there are two cells on different carriers and measurement gaps are provided

#### A.8.5.2.3 SS-SINR

##### A.8.5.2.3.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

A.8.5.2.3.1.1 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 9.11.3 in TS 36.133 [15] for inter-RAT FR1 SS-SINR measurements.

A.8.5.2.3.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.3.1.2-2.

Table A.8.5.2.3.1.2-1: SS- SINR Inter-RAT SS- SINR supported test configurations

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

Table A.8.5.2.3.1.2-2: SS-SINR inter-RAT test parameters

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
| Cell 2 | | Cell 2 | | Cell 2 | |
| SSB ARFCN | | |  | freq1 | | freq1 | | freq1 | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | |
| Config 2,3,5,6 | TDD | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | - | | - | | - | |
| Config 2,5 |
| Config 3,6 |
| RMSI CORESET Reference Channel | | Config 1,4 |  | - | | - | | - | |
| Config 2,5 |
| Config 3,6 |
| Dedicated CORESET Reference Channel | | Config 1,4 |  | - | | - | | - | |
| Config 2,5 |
| Config 3,6 |
| OCNG Patterns | | |  | OP.1 | | | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | | | |
| SMTC configruation | | |  | SMTC.1 | | | | | |
| SSB configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | | | |
| Config 3,6 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -88 | | -108.5 | | -119.5 | |
| NR\_FDD\_FR1\_B | -119 | |
| NR\_TDD\_FR1\_C | -118.5 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -118 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -117.5 | |
| NR\_FDD\_FR1\_G | -116.5 | |
| NR\_FDD\_FR1\_H | -116 | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -88 | | -108.5 | | Same as Noc for 15kHz | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -85 | | -105.5 | | -116.5 | |
| NR\_FDD\_FR1\_B | -116 | |
| NR\_TDD\_FR1\_C | -115.5 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -115 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114.5 | |
| NR\_FDD\_FR1\_G | -114.5 | |
| NR\_FDD\_FR1\_H | -113 | |
|  | | | dB | -1.75 | | 20 | | -4.0 | |
|  | | | dB | -1.75 | | 20 | | -4.0 | |
| SS-RSRPNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -89.75 | | -88.5 | | -123.5 | |
| NR\_FDD\_FR1\_B | -123 | |
| NR\_TDD\_FR1\_C | -122.5 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -122 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -121.5 | |
| NR\_FDD\_FR1\_G | -120.5 | |
| NR\_FDD\_FR1\_H | -120 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -86.75 | | -85.5 | | -120.5 | |
| NR\_FDD\_FR1\_B | -120 | |
| NR\_TDD\_FR1\_C | -119.5 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -119 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -118.5 | |
| NR\_FDD\_FR1\_G | -117.5 | |
| NR\_FDD\_FR1\_H | -117 | |
| SS-SINR Note3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dB | -1.75 | | 20 | | -4.0 | |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -57.83 | | -60.5 | | -90.09 | |
| NR\_FDD\_FR1\_B | -89.59 | |
| NR\_TDD\_FR1\_C | -89.09 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -88.59 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -88.09 | |
| NR\_FDD\_FR1\_G | -87.09 | |
| NR\_FDD\_FR1\_H | -86.59 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -51.73 | | -54.41 | | -84 | |
| NR\_FDD\_FR1\_B | -83.5 | |
| NR\_TDD\_FR1\_C | -83 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -82.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -82 | |
| NR\_FDD\_FR1\_G | -81 | |
| NR\_FDD\_FR1\_H | -80.5 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | |

A.8.5.2.3.1.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

##### A.8.5.2.3.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

###### A.8.5.2.3.2.1 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 clause 9.11.3 in TS 36.133 [15] for inter-RAT FR2 SS-SINR measurements.

###### A.8.5.2.3.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.2.2-1. In this test case there are two cells on different carriers. Absolute accuracy requirements of SS-SINR inter-RAT measurement are tested by using test setup in Table A.8.5.2.3.2.2-2 and A.8.5.2.3.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.8.5.2.3.2.2-1: SS-SINR Inter-RAT SS-SINR supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.8.5.2.3.2.2-2: SS-SINR Inter-RAT general test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 | Test 3 |
| Cell 2 | Cell 2 | Cell 2 |
| SSB ARFCN |  | Freq1 | freq1 | freq1 |
| Duplex mode |  | TDD | TDD | TDD |
| TDD configuration |  | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Downlink initial BWP configuration |  | DLBWP.0.1 | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | |
| DRX cycle configuration | ms | Not applicable | | |
| PDSCH Reference measurement channel |  | - | - | - |
| RMSI CORESET Reference Channel |  | - | - | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
|  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void.  Note 3: Void.  Note 4: Void. | | | | |

Table A.8.5.2.3.2.2-3: SS-SINR Inter-RAT OTA related test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 | Test 3 |
| Cell 2 | Cell 2 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1 |
| Assumption for UE beamsNote 10 |  | Rough | Rough | Rough |
| Note1 | dBm/15kHz Note4 | -104.7 | -104.7 | (Table B.2.3-2 Rx Beam Peak -5dB)  (Note 7) |
| Note1 | dBm/SCS Note4 | -95.7 | -95.7 | (Table B.2.3-2 Rx Beam Peak +4dB)  (Note 7) |
|  | dB | -0.5 | 11 | -1.0 |
| SSB\_RPNote2 | dBm/SCS Note4 | -96.2 | -84.7 | (Table B.2.3-2 Rx Beam Peak +3dB)  (Note 8) |
| SS-SINRNote2 | dB | -0.5 | 11 | -1.0 |
| Note2 | dB | -0.5 | 11 | -1.0 |
| IoNote2 | dBm/95.04 MHz Note4 | -63.95 | -55.38 | (Table B.2.3-2 Rx Beam Peak +35.54dB)  (Note 9) |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, SS-SINR, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.  Note 5: Void  Note 6: Void  Note 7: Noc for SCS 15kHz is applied at -10log10(8)+4dB above the minimum level specified in Table B.2.3-2 for beam peak. Noc for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 8: SSB\_RP is applied at 3dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 9: Io is applied at level 10log10(792)+6.54dB above the minimum level specified in Table B.2.3-2 for beam peak.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | |

###### A.8.5.2.3.2.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].