**3GPP TSG- RAN4 Meeting #** **112 *R4-2412213***

**Maastricht, Netherlands, 19th – 23rd August, 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **4792** | **rev** | **-** | **Current version:** | **18.6.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Correction on LTM test cases |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_Mob\_enh2-Perf |  | ***Date:*** | 2024-7-26 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | In PDCCH order RACH tests, TSSB is not correct and accurate. In FR1 LTM cell switch tests, L3 measurement shall be reported with SSB index, set includeBeamMeasurements to TURE. A.6.3.4.4 test the title is incorrect, it shall be without L1-RSRP measurement rather than with L1-RSRP measurement.In FR2 LTM cell switch test (RACH-less Intra-frequency PCell switch from FR2 to FR2), RSRP value is not correct. |
|  |  |
| ***Summary of change:*** | Correct and update TSSB description in PDCCH order RACH tests. Set includeBeamMeasurements to TURE in FR1 LTM cell switch tests,. A.6.3.4.4 test shall be without L1-RSRP measurement rather than with L1-RSRP measurement.Correct RSRP value in FR2 LTM cell switch test (RACH-less Intra-frequency PCell switch from FR2 to FR2). |
|  |  |
| ***Consequences if not approved:*** | R18 EMR is not correctly implemented. |
|  |  |
| ***Clauses affected:*** | A.6.3.2.4, A.6.3.4.1, A.6.3.4.3, A.7.3.4.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS38.533 |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Start of Change 1>

#### A.6.3.2.4 LTM PDCCH-order Random Access

##### A.6.3.2.4.1 PDCCH-order RACH on neighbor cell in FR1 when RACH BW is within active UL BWP

A.6.3.2.4.1.1 Test Purpose and Environment

This test is to verify the requirement for PDCCH-order RACH on neighbour cell in FR1 when RACH BW is within active UL BWP specified in clause 8.1 in 38.213 [3] and UE transmit timing in clause 7.1 for UE supporting *rach-EarlyTA-Measurement-r18*.

A.6.3.2.4.1.2 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. Test configurations are given in table A.6.3.2.4.1.2-1. Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table A.6.3.2.4.1.2-2 and A.6.3.2.4.1.2-3.

This test contains 3 tests (test 1, 2, and 3) and UE may have to pass one of the tests based on the conditions defined in this clause.

In test 1, joint TCI state configuration as defined in Table A.6.3.2.4.1.2-2 is provided.

In test 2, separate TCI state configuration as defined in Table A.6.3.2.4.1.2-2 is provided.

In test 3, no candidate TCI state configurations are configured as in Table A.6.3.2.4.1.2-2.

If a UE supports *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 1. If a UE supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 2. If a UE supports neither *ltm-MAC-CE-SeparateTCI-r18* nor *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 3.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. No gap patterns are configured in the test case.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- 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.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- For tests 1, 2, 3, the UE has reported L3 measurement results and performed SSB based L1-RSRP measurement on Cell 2.

In test 1, 2 and 3, T1 starts from UE transmitting a valid L1 report on Cell 2.

In test 1 and test 2, after receiving the first L1 report on Cell 2 during T1, the test equipment sends TCI state activation MAC CE to active TCI state of Cell 2 no later than 100 ms after receiving the L1 report.

- In test 1, CandidateTCI-State#1 is activated.

- In test 2, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are activated.

- In test 3, test equipment shall not send TCI state activation MAC CE to active TCI state of Cell 2.

The start of T2 is the instant when PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE.

Table A.6.3.2.4.1.2-1: PDCCH order RACH on Neighbor cell in FR1 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeCandidate 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 modeCandidate 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 modeCandidate: 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.6.3.2.4.1.2-2: General test parameters for PDCCH order RACH in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1 | Test 2  | Test 3 |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 1 | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | dB | -6 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | ms | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | DRX is not used |
| Time offset between cells |  | 2 μs | RTD between cells is less than CP |
| deriveSSB-IndexFromCell |  | Enabled |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | Same as Cell 1 |
| PRACH configuration |  | FR1 PRACH configuration 5 | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 |
| n-TimingAdvanceOffset | Tc | 25600 |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State #1 |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | N/A | As specified in clause A.3.16B.Configured for early TCI state activation for test 1 and test 2. |
| Ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | As specified in clause A.3.16B.Configured for early TCI state activation for test 2. |
| Ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | 0.3 |  |
| T2 | s | ≤0.5 |  |

Table A.6.3.2.4.1.2-3: Cell specific test parameters for PDCCH order RACH 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 |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD | N/A |
| measurement channel | Config 2 |  | SR.1.1 TDD | N/A |
|  | Config 3 |  | SR.2.1 TDD | N/A |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | N/A |
|  | Config 2 | CR.1.1 TDD | N/A |
|  | Config 3 | CR.2.1 TDD | N/A |
| CP length |  |  | Normal |
| 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 |
|  | Config 3 |  | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 |
|  | Config 3 |  | 30 |
| 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 | -0.64 | -0.64 | -0.64 | -0.64 |
|  | dB | 8 | 8 | 8 | 8 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 |
|  | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
|  | Config 3 | dBm/38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |
| 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.6.3.2.4.1.3 Test Requirements

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after + 0.5ms + from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: , where:

- is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [26].

- = 0, = 0, = 0

- = 0.5ms

- = 0 for UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*, otherwise , where is [the time to first SSB after 1 slot from the end of the slot that UE receives PDCCH-order], and = 2 ms, which is the time for SSB processing.

During T2, interruption on Cell 1 UL shall not happen outside [the overlapped slot to transmit PRACH] and symbols before and after the PRACH occasion as defined in clause 8.1 in 38.213 [3], where N=2. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

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.

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

<End of Change 1>

<Start of Change 2>

##### A.6.3.2.4.2 PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM

A.6.3.2.4.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM. The Te requirements are specified in 7.1. The interruption requirements specified in clause 8.2.2.2.20. This test is for UE supporting PDCCH-ordered RACH to an inter-frequency candidate cell, whose SSB is outside active BWPs of the UE.

A.6.3.2.4.2.2 Test Parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency from the PCell. Test configurations are given in table A.6.3.2.4.2.2-1. Both interruption length and Te requirements for the first uplink transmission are tested by using the parameters in table A.6.3.2.4.2.2-2 and A.6.3.2.4.2.2-3.

The test consists of 2 tests, and UE is required to pass one among Test 1, Test 2.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18*

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*

The test consists of two successive time periods, with time durations of T1 and T2, respectively. Measurement gap patterns are configured in the test case and the SSB of Cell2 is outside the active BWP of Cell 1. The PCell is continuously scheduled during the whole test.

Before T1, for Test 1, 2:

- Cell 1 and Cell 2 on radio channel 1 are powered on.

- UE establishes a connection with the Cell 1.

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used. UE has reported an L3 measurement result of Cell 2 to Cell 1.

- UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.6.3.2.4.2.2-2 for Test 1 is provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2, and UE has already reported a valid L1-RSRP result of Cell 2.

During T1, for Test 1:

- At the start of T1, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1, *CandidateTCI-State#1* is activated.

- T1 ends 100ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2, T1 is skipped.

During T2, for Test 1, 2:

- At the start of T2, UE receives PDCCH order to trigger PRACH transmission on Cell 2.

- T2 ends with UE back to Cell 1 after transmitting PRACH to Cell 2.

- The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during the transmission of PDCCH ordered RACH.

- 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

Table A.6.3.2.4.2.2-1: Inter-frequency PDCCH-ordered RACH from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeTarget 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 modeTarget 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 modeTarget 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.6.3.2.4.2.2-2: General test parameters for Inter-frequency PDCCH-ordered RACH test from FR1 to FR1 from FR1 to FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1 | Test 2 |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 1 |  |
| A3-Offset | dB | -6 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| Measurement gap periodicity | ms | 80 |  |
| DRX |  | OFF | DRX is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells |  | 2 μs | RTD between cells is less than CP |
| reportQuantityRS-Indexes |  | Rsrp |  |
| maxNrofRS-IndexesToReport |  | 1 |  |
| includeBeamMeasurements |  | True |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 2 | Cell 2 |
|  | PRACH configuration |  | FR1 PRACH configuration 6 |  |
|  | bwp-GenericParameters |  | ULBWP.0.1 |  |
|  | n-TimingAdvanceOffset | Tc | 25600 |  |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | N/A | As specified in clause A.3.16B.In test 1, CandidateTCI-State#1 is configured for early TCI state activation.In test 2, CandidateTCI-State#1 isconfigured for TCI state indication in cell switch command. |
| ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | ≤0.1 |  |
| T2 | s | ≤0.2 |  |

Table A.6.3.2.4.2.2-3: Cell specific test parameters for NR FR1-FR1 Inter-frequency PDCCH-ordered RACH test

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |
| DRx Cycle | ms | Not Applicable |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD |
| measurement channel | 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 for serving cell | 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 |
|  | Config 3 |  | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 |
|  | Config 3 |  | 30 |
| PRACH configuration  |  | FR1 PRACH configuration 6 |
| 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 | 4 |
|  | dB | 8 | 4 |
| SSB\_RP | Config 1,2 | dBm/SCS | -87 | -90 |
|  | Config 3 | dBm/SCS | -84 | -87 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -57.06 | -61.41 |
|  | Config 3 | dBm/9.36MHz | -50.96 | -55.31 |
| 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.6.3.2.4.2.3 Test Requirements

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after + 0.5ms + from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: , where:

- is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [26].

- = 0, = 0

- = 0.5ms

- is defined in 6.2.2C

- = 0 for UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*, otherwise , where is [the time to first SSB occasion overlapped with MGL after [2]ms and 1 slot from the end of the slot that UE receives PDCCH-order], and = 2 ms, which is the time for SSB processing.

During T2, interruption on Cell 1 UL shall not happen outside [the overlapped slot to transmit PRACH] and symbols before and after the PRACH occasion as defined in clause 8.1 in 38.213 [3], where N=2. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

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.

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

<End of Change 2>

<Start of Change 3>

##### A.6.3.2.4.3 PDCCH-order RACH on neighbor cell without L1-RSRP measurement in FR1 when RACH BW is within active UL BWP

A.6.3.2.4.3.1 Test Purpose and Environment

This test is to verify the requirement for PDCCH-order RACH on neighbour cell without L1-RSRP measurement in FR1 when RACH BW is within active UL BWP specified in clause 8.1 in 38.213 [3] and UE transmit timing in clause 7.1 for UE supporting *rach-EarlyTA-Measurement-r18.*

A.6.3.2.4.3.2 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. Test configurations are given in table A.6.3.2.4.3.2-1. Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table A.6.3.2.4.3.2-2 and A.6.3.2.4.3.2-3.

This test contains 3 tests (test 1, 2 and 3) and UE may have to pass one of the tests based on the conditions defined in this clause.

- In test 1, joint TCI state configuration as defined in Table A.6.3.2.4.3.2-2 is provided.

- In test 2, separate TCI state configuration as defined in Table A.6.3.2.4.3.2-2 is provided.

- In test 3, no candidate TCI state configurations are configured as in Table A.6.3.2.4.3.2-2.

If a UE supports *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 1. If a UE supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 2. If a UE supports neither *ltm-MAC-CE-SeparateTCI-r18* nor *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 3. The test consists of two successive time periods, with time durations of T1 and T2 respectively. No gap patterns are configured in the test case.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- 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.

In test 1, 2 and 3, T1 starts from UE transmitting a L3 report on Cell 2. In test 1 and test 2, after receiving the L3 report on Cell 2 during T1, the test equipment sends TCI state activation MAC CE to active TCI state of Cell 2 no later than 100 ms after receiving the L3 report.

- In test 1, CandidateTCI-State#1 is activated.

- In test 2, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are activated.

- In test 3, test equipment shall not send TCI state activation MAC CE to active TCI state of Cell 2.

The start of T2 is the instant when PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE.

Table A.6.3.2.4.3.2-1: PDCCH order RACH on Neighbor cell in FR1 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeCandidate 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 modeCandidate 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 modeCandidate: 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.6.3.2.4.3.2-2: General test parameters for PDCCH order RACH in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1 | Test 2  | Test 3 |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 1 | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | dB | -6 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | ms | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | DRX is not used |
| Time offset between cells |  | 2 μs | RTD between cells is less than CP |
| deriveSSB-IndexFromCell |  | Enabled |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | Same as Cell 1 |
| PRACH configuration |  | FR1 PRACH configuration 5 | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 |
| n-TimingAdvanceOffset | Tc | 25600 |  |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | N/A | As specified in clause A.3.16B.Configured for early TCI state activation for test 1 and test 2. |
| Ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | As specified in clause A.3.16B.Configured for early TCI state activation for test 2. |
| Ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | 0.3 |  |
| T2 | s | ≤0.5 |  |

Table A.6.3.2.4.3.2-3: Cell specific test parameters for PDCCH order RACH 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 |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD | N/A |
| measurement channel | Config 2 |  | SR.1.1 TDD | N/A |
|  | Config 3 |  | SR.2.1 TDD | N/A |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | N/A |
|  | Config 2 | CR.1.1 TDD | N/A |
|  | Config 3 | CR.2.1 TDD | N/A |
| CP length |  |  | Normal |
| 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 |
|  | Config 3 |  | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 |
|  | Config 3 |  | 30 |
| 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 | -0.64 | -0.64 | -0.64 | -0.64 |
|  | dB | -1 | -1 | -1 | -1 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 |
|  | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
|  | Config 3 | dBm/38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |
| 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.6.3.2.4.3.3 Test Requirements

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after + 0.5ms + from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: , where:

- is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [26].

- = 0, = 0, = 0

- = 0.5ms

- is the time to first SSB occasion, after 1slot from the end of the slot of the PDCCH plus 2ms (SSB processing time) .

During T2, interruption on Cell 1 UL shall not happen outside the overlapped slot to transmit PRACH and symbols before and after the PRACH occasion as defined in clause 8.1 in 38.213 [3], where N=2. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

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.

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

<End of Change 3>

<Start of Change 4>

#### A.6.3.4.1 RACH-based Intra-frequency PCell switch from FR1 to FR1

##### A.6.3.4.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 RACH-based intra frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.6.3.4.1.2 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. Test configurations are given in table A.6.3.4.1.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.6.3.4.1.2-2 and A.6.3.4.1.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of four successive time periods, with time durations of T1 to T4 respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- In Test 1A and Test 2A, joint TCI state configurations as defined in Table A.6.3.4.1.2-2 are provided.

- In Test 1B and Test 2B, separate TCI state configurations as defined in Table A.6.3.4.1.2-2 are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- The start of T4 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell. Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- T4 ends upon the reception of PRACH at Cell 2.

Table A.6.3.4.1.2-1: Intra-frequency cell switch from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeTarget 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 modeTarget 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 modeTarget 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.6.3.4.1.2-2: General test parameters for Intra-frequency cell switch from FR1 to FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | dB | -6 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| includeBeamMeasurements |  | TURE |  |
| DRX |  | OFF | DRX is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells |  | 2 μs | RTD between cells is less than CP |
| deriveSSB-IndexFromCell |  | Enabled |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| #2CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
| ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | <3 |  |
| T2 | s | ≤0.2 |  |
| T3 | s | ≤0.1 |  |
| T4 | s | ≤0.1 |  |

Table A.6.3.4.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency cell switch test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1~T4 | T1~T4 |
| 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 |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD |
| measurement channel | Config 2 |  | SR.1.1 TDD |
|  | Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
|  | Config 2 | CR.1.1 TDD |
|  | Config 3 | CR.2.1 TDD |
| CP length |  |  | Normal |
| 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 |
|  | Config 3 |  | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15  |
|  | Config 3 |  | 30 |
| PRACH configuration  |  | FR1 PRACH configuration 6 |
| 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 | -0.64 | -0.64 | -0.64 | -0.64 |
|  | dB | 8 | 8 | 8 | 8 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 |
|  | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
|  | Config 3 | dBm/38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |
| 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.6.3.4.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 in no later than DLTM from the beginning of time period T4. The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2. TLTM-interrupt = TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU ms and is specified in clause 6.3.1.2.1

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B

 - TLTM-IU\_=20ms

- TLTM-RRC-processing =10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise TLTM-RRC-processing =0ms

- TLTM-processing =10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing =15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing =20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

<End of Change 4>

<Start of Change 5>

#### A.6.3.4.3 RACH-less Intra-frequency PCell switch from FR1 to FR1

##### A.6.3.4.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 RACH-less intra frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.6.3.4.3.2 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. Supported test configurations are shown in table A.6.3.4.3.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.6.3.4.3.2-2 and A.6.3.4.3.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.6.3.4.3.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.6.3.4.3.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- At the start of T4, UE receives PDCCH order to trigger PRACH transmission on Cell 2.

- T4 ends 5ms after the UE transmits the PRACH to Cell 2.

- For UE incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped.

During T5, for Test 1A, 1B, 2A and 2B:

- The start of T5 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell and the field of Timing Advance Command is set to 0.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- Cell 2 continuously schedules PUSCH for the UE.

- T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the first DL slot not earlier than (Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier.

- The values of Tcmd, TLTM-RRC-processing TLTM-processing,Tfirst-RS and TRS-proc are specified in A.6.3.4.3.3.

Table A.6.3.4.3.2-1: Intra-frequency cell switch from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeTarget 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 modeTarget 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 modeTarget 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.6.3.4.3.2-2: General test parameters Intra-frequency cell switch from FR1 to FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | dB | -6 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| includeBeamMeasurements |  | TURE |  |
| DRX |  | OFF | DRX is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells |  | 2 μs | RTD between cells is less than CP |
| deriveSSB-IndexFromCell |  | Enabled |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | Same as Cell 1 |
| PRACH configuration |  | FR1 PRACH configuration 5 | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 |  |
| n-TimingAdvanceOffset | Tc | 25600 |  |
| ltm-CSI-SSB-ResourceList |  | SSB 0 of Cell 2 |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
| ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | <3 |  |
| T2 | s | ≤0.2 |  |
| T3 | s | ≤0.1 |  |
| T4 | s | ≤0.2 |  |
| T5 | s | ≤0.1 |  |

Table A.6.3.4.3.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency cell switch test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1~T5 | T1~T5 |
| 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 | Config 1 |  | SR.1.1 FDD |
| measurement channel | Config 2 |  | SR.1.1 TDD |
|  | Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
|  | Config 2 | CR.1.1 TDD |
|  | Config 3 | 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 |
|  | Config 3 |  | 30  |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15  |
|  | Config 3 |  | 30 |
| PRACH configuration  |  | FR1 PRACH configuration 6 |
| 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 | [-0.64] | [-0.64] |
|  | dB | [8] | [8] |
| SSB\_RP | Config 1,2 | dBm/SCS | [-90] | [-90] |
|  | Config 3 | dBm/SCS | [-87] | [-87] |
| IoNote3 | Config 1,2 | dBm/9.36MHz | [-58.7] | [-58.7] |
|  | Config 3 | dBm/38.16MHz | [-52.6] | [-52.6] |
| 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.6.3.4.3.3 Test Requirements

The UE shall start to transmit PUSCH to Cell 2 in no later than DLTM from the beginning of time period T5.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2.

TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU. Tfirst-RS + TRS-proc=0 for Test 1A and 1B, Tfirst-RS + TRS-proc=22ms for Test 2A and 2B, and TLTM-IU\_is the uncertainty on transmitting the first uplink transmission on Cell 2.

- TLTM-RRC-processing = 10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

#### A.6.3.4.4 RACH-less Intra-frequency PCell switch from FR1 to FR1 without L1-RSRP measurement

##### A.6.3.4.4.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 RACH-less intra frequency PCell switch specified in clause 6.3.1 without L1-RSRP measurement and measurement reporting.

##### A.6.3.4.4.2 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. Supported test configurations are shown in table A.6.3.4.4.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.6.3.4.4.2-2 and A.6.3.4.4.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.6.3.4.4.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.6.3.4.4.2-2 for Test 1B and Test 2B are provided.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- At the start of T4, UE receives PDCCH order to trigger PRACH transmission on Cell 2.

- T4 ends 5ms after the UE transmits the PRACH to Cell 2.

- For UE incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped.

During T5, for Test 1A, 1B, 2A and 2B:

- The start of T5 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell and the field of Timing Advance Command is set to 0.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- Cell 2 continuously schedules PUSCH for the UE.

- T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the first DL slot not earlier than (Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier.

- The values of Tcmd, TLTM-RRC-processing TLTM-processing,Tfirst-RS and TRS-proc are specified in A.6.3.4.3.3.

Table A.6.3.4.4.2-1: Intra-frequency cell switch from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeTarget 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 modeTarget 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 modeTarget 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.6.3.4.4.2-2: General test parameters Intra-frequency cell switch from FR1 to FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | dB | -6 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| includeBeamMeasurements |  | TURE |  |
| DRX |  | OFF | DRX is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells |  | 2 μs | RTD between cells is less than CP |
| deriveSSB-IndexFromCell |  | Enabled |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | Same as Cell 1 |
| PRACH configuration |  | FR1 PRACH configuration 5 | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 |  |
| n-TimingAdvanceOffset | Tc | 25600 |  |
| ltm-CSI-SSB-ResourceList |  | SSB 0 of Cell 2 |  |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
| ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | <3 |  |
| T2 | s | ≤0.2 |  |
| T3 | s | ≤0.1 |  |
| T4 | s | ≤0.2 |  |
| T5 | s | ≤0.1 |  |

Table A.6.3.4.4.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency cell switch test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1~T5 | T1~T5 |
| 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 | Config 1 |  | SR.1.1 FDD |
| measurement channel | Config 2 |  | SR.1.1 TDD |
|  | Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
|  | Config 2 | CR.1.1 TDD |
|  | Config 3 | 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 |
|  | Config 3 |  | 30  |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15  |
|  | Config 3 |  | 30 |
| PRACH configuration  |  | FR1 PRACH configuration 6 |
| 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 | -0.64 | -0.64 |
|  | dB | 8 | 8 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 |
|  | Config 3 | dBm/SCS | -87 | -87 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -58.7 | -58.7 |
|  | Config 3 | dBm/38.16MHz | -52.6 | -52.6 |
| 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.6.3.4.4.3 Test Requirements

The UE shall start to transmit PUSCH to Cell 2 in no later than DLTM from the beginning of time period T5.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2.

TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU. Tfirst-RS + TRS-proc=0 for Test 1A and 1B, Tfirst-RS + TRS-proc=22ms for Test 2A and 2B, and TLTM-IU\_is the uncertainty on transmitting the first uplink transmission on Cell 2.

- TLTM-RRC-processing = 10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

<End of Change 5>

<Start of Change 6>

#### A.7.3.4.2 RACH-less Intra-frequency PCell switch from FR2 to FR2

##### A.7.3.4.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 RACH-less intra frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.7.3.4.2.2 Test Parameters

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table A.7.3.4.2.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.7.3.4.2.2-2 and A.7.3.4.2.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.7.3.4.2.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.7.3.4.2.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- At the start of T4, UE receives PDCCH order to trigger PRACH transmission on Cell 2.

- T4 ends 5ms after the UE transmits the PRACH to Cell 2.

- For UE incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped.

During T5, for Test 1A, 1B, 2A and 2B:

- The start of T5 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell and the field of Timing Advance Command is set to 0.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- Cell 2 continuously schedules PUSCH for the UE.

- T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the fist DL slot not earlier than (Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier.

- The values of Tcmd, TLTM-RRC-processing TLTM-processing, Tfirst-RS and TRS-proc are specified in A.7.3.4.2.3.

Table A.7.3.4.2.2-1: Intra-frequency cell switch from FR2 to FR2 test configurations

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

Table A.7.3.4.2.2-2: General test parameters for Intra-frequency cell switch from FR2 to FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset | dB | -30 |  |
| Hysteresis | dB | 0 |  |
| Time To Trigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | DRX is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells |  | 0.3 μs | RTD between cells is less than CP |
| deriveSSB-IndexFromCell |  | Enabled |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | Same as Cell 1 |
| PRACH configuration |  | FR2 PRACH configuration 5 | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 |
| n-TimingAdvanceOffset | Tc | N/A |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | As specified in clause A.3.16B.In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 areconfigured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
| ltm-ConfigComplete |  | True | Candidate cell’s configuration is complete configuration |
| T1 | s | <3 |  |
| T2 | s | ≤0.2 |  |
| T3 | s | ≤0.1 |  |
| T4 | s | ≤0.2 |  |
| T5 | s | ≤0.1 |  |

Table A.7.3.4.2.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency cell switch test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1 ~ T5 | T1 ~ T5 |
| NR RF Channel Number |  | 1 | 1 |
| Assumption for UE beamsNote 6 |  | Rough | Rough |
| AoA setup |  | Setup 1 as defined in A.3.15 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.2.1 |
| BWchannel | MHz | 100: NRB,c = 66 |
| BWP BW | MHz | 100: NRB,c = 66 |
| PDSCH Reference |  | SR3.1 TDD |
| CORESET Reference Channel |  | CR3.1 TDD |
| Control Channel RMC |  | CCR.3.1 TDD |
| CP length |  | Normal |
| TRS configuration |  | TRS.2.1 TDD |
| OCNG Patterns |  | OP.1 |
| SMTC Configuration |  | SMTC.1 |
| SSB Configuration |  | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 |
| PRACH configuration  |  | FR2 PRACH configuration 6 |
| 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 | -104.7 |
| Note2 | dBm/SCS | -95.7 |
|  | dB | -1.8 | 0 |
|  | dB | 6 | 7 |
| SSB\_RP |  | dBm/SCS | -89.7 | -88.7 |
| IoNote3 |  | dBm/95.04MHz | -56.7 | -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. |

##### A.7.3.4.2.3 Test Requirements

The UE shall start to transmit PUSCH to Cell 2 in no later than DLTM from the beginning of time period T5.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3 ms and is specified in clause 6.3.1.2, TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU,

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B,

 - TLTM-IU is the uncertainty on transmitting the first uplink transmission on Cell 2.

- TLTM-RRC-processing = 10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports *ltm-FastProcessingConfig-r18* capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports *ltm-FastProcessingConfig-r18* capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support *ltm-FastProcessingConfig-r18* capability.

<Start of Change 6>