**3GPP TSG-RAN WG4 Meeting #111 R4-2407775**

Fukuoka City, Fukuoka , Japan, 20th – 24th May, 2024

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** |  | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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:*** | draft CR on PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for R18 LTM | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh2-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 17) Rel-17 (Release 18) Rel-18 (Release 19) Rel-19 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduce test case for PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for R18 LTM | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce test case for PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for R18 LTM | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Test case is not defined. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.6.3.2.y | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change #1>

#### A.6.3.2.y PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM

##### A.6.3.2.y.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.y.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.x.5.2-1. Both interruption length and Te requirements for the first uplink transmission are tested by using the parameters in table A.6.3.2.y.2-2, A.6.3.2.y.2-3, and A.6.3.2.y.2-4.

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.x.5.2-2 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.y.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 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.y.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 |
| 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 | 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 is  configured 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.y.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 | 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 |  | 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 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 | 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.y.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

- and are defined in 6.2.2C

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>