**3GPP TSG-RAN WG4 Meeting # 111R4-2407849**

**Fukuoka, Japan, May 20 – May 24, 2024**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **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:*** | DraftCR on TC for MAC CE based DL separate dual TCI state activation in sDCI | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Xiaomi | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MIMO\_evo\_DL\_UL-Perf | | | | |  | ***Date:*** | | | 2024-5-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)*  *Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Core requirement for MAC CE based DL separate dual TCI state activation in sDCI is defined and corresponding tset case needs to be defined. | | | | | | | | |
|  | |  | | | | | | | | |
| Summary of change: | | Dual TCI state switch in sDCI will happen for [RS0, RS1] to [RS2, RS3]     1. Add two TRS configurations in A.3.17.2 2. In A.7.5.13.x, Add test case for MAC CE based DL separate dual TCI state activation in sDCI. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The test case will be missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.3.17.2, new A.7.5.13.x | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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.3.17.2 Configuration of CSI-RS for tracking for FR2

#### A.3.17.2.1 TDD

Table A.3.17.2.1-1: CSI-RS for tracking for SCS=120kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 1 for CSI-RS resource 1 and 3  l0 = 5 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2  41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

Table A.3.17.2.1-2: CSI-RS for tracking for SCS=120kHz Set 2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.2 TDD |
| Bandwidth |  | BW of Active BWPNote 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 2 for CSI-RS resource 1 and 3  l0 = 6 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2  41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.1 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

Table A.3.17.2.1-3: Aperiodic CSI-RS for tracking for SCS=120kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.3 TDD |
| Bandwidth |  | BW of Active BWPNote 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 1 for CSI-RS resource 1 and 3  l0 = 5 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2  3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

Table A.3.17.2.1-4: CSI-RS for tracking for SCS=120kHz Set 3

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.4 TDD |
| Bandwidth |  | BW of Active BWPNote 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 3 for CSI-RS resource 1 and 3  l0 = 7 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2  41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.x |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

Table A.3.17.2.1-5: CSI-RS for tracking for SCS=120kHz Set 4

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.5 TDD |
| Bandwidth |  | BW of Active BWPNote 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 4 for CSI-RS resource 1 and 3  l0 = 8 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2  41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.x |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

# <End of Change #1>

# <Start of Change #2>

#### A.7.5.13.x MAC-CE based dual downlink TCI state switching delay for unified TCI for single-DCI mTRP

##### A.7.5.13.x.1 NR PCell FR2 dual downlink TCI state switch in sDCI for known case

###### A.7.5.13.x.1.1 Test Purpose and Environment

The purpose of this test is to verify the MAC-CE based dual downlink TCI state switch delay requirement defined in clause 8.21.3. Supported test configuration is shown in Table A.7.5.13.x.1.1-1.

Table A.7.5.13.x.1.1-1: Supported test configurations

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

###### A.7.5.13.x.1.2 Test Parameters

There is one active serving cell (Cell 1) configured with two TRPs in the test. Cell-specific parameters of Cell 1 are specified in Table A.7.5.13.x.1.2-2 below. The OTA related test parameters for FR2 are shown in Table A.7.5.13.x.1.2-3.

PDCCHs indicating new transmissions shall be sent continuously on TRP0 to ensure that the UE would have ACK/NACK sending.

Before the test starts,

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

- UE is provided with *dl-OrJoint-TCIStateList-r17* and UE’s higher layer signalling *unifiedTCI-StateType-r17* in IE *MIMOParam-r17* is set to *separate.*

- UE is configured with SSB-based L1-RSRP measurements on Cell 1

- UE is configured with two TCI states (TCI state 0 and TCI state 2) for TRP0 and two TCI states(TCI state 1 and TCI state 3) for TRP1. QCL info to DL TCI state 0, 1 , 2 and 3 are provided by SSB0, SSB1, SSB2 and SSB3, respectively.

- UE is indicated in TCI state 0 and TCI state 1 as the active TCI state for TRP0 and TRP1

The test consists of two time periods, T1 and T2. During T1, source RS in TCI state 0 and TCI state 1 are transmitted. At the beginning of T2, source RS in TCI state 2 and source RS in TCI state 3 start transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms after the slot in which UE provides L1-RSRP report with results for source RSs in TCI state 2 and 3, UE receives a MAC-CE command indicating a switch to TCI state 2 and 3 for two TRPs. *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 by two TRPs on TCI state 0 and TCI state 1 till slot n+ THARQ +. The test equipment also verifies the TCI state switch time for two TRPs by scheduling the UE on TCI state 2 and TCI state 3 after slot after slot n+ THARQ + + max{TOk1\*(Tfirst-SSB1 + AD1\*TSSB1 + TSSB-proc), TOk2\*(Tfirst-SSB2 + AD2\*TSSB2 + TSSB-proc)} / NR slot length.

Table A.7.5.13.x.1.2-1: 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 |  |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS |  | SSB0 and SSB2 of TRP0, SSB1 and SSB3 of TRP1 | L1-RSRP measurements of SSB0, SSB1 SSB2 and SSB3. |
| Number of RS for L1-RSRP reporting |  | 4 | four source RSs in TCI state 0,1, 2,3. |
| Cell2 timing offset to cell1 | us | <CP |  |
| T1 | s | 0.2 |  |
| T2 | s | 1 |  |

Table A.7.5.13.x.1.2-2: NR Cell specific test parameters

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 24 |
| 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.17 FR2 |
| SMTC Configuration |  | SMTC.1 |
| DL TCI State 0 |  | DLorJoint TCI.State.0 |
| DL TCI State 1 |  | DLorJoint TCI.State.1 |
| DL TCI State 2 |  | DLorJoint TCI.State.6 |
| DL TCI State 3 |  | DLorJoint TCI.State.7 |
| TRS Configuration |  | TRS.2.1 TDD for DLorJoint TCI.State.0  TRS.2.2 TDD for DLorJoint TCI.State.1  TRS.2.4 TDD for DLorJoint TCI.State.6  TRS.2.5 TDD for DLorJoint TCI.State.7 |
| Pathloss RS Configuration |  | Resource #4 in TRS.2.1 TDD |
| reportQuantity for SSB |  | ssb-Index-RSRP-Index-r17 |
| reportConfigType for SSB |  | periodic |
| 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.7.5.13.x.1.2-3: OTA related test parameters for TCI state switch

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Units | TRP0 | | | | TRP1 | | | |
|  |  | SSB0 | | SSB2 | | SSB1 | | SSB3 | |
|  |  | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | Setup [TBD] according to clause A.3.XX | | | | | | | |
|  |  | AoA1 | | AoA2 | | AoA2 | | AoA3 | |
| Assumption for UE beams Note 6 |  | Rough | | | | | | | |
| Ês | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B\_RP Note 2 | dBm/ SCS | -80.6 | -80.6 | -Infinity | -80.6 | -80.6 | -80.6 | -Infinity | -80.6 |
| BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 | 8.3 | 8.3 | -Infinity | 8.3 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -56.0 | -56.0 | -56.0 | - Infinity | -56.0 |
| Note 1: Void  Note 2: SS B\_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. | | | | | | | | | |

###### A.7.5.13.x.1.3 Test Requirements

During T2, the test verifies that UE can be scheduled by two TRPs on TCI state 2 and TCI state 3.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on DL TCI state 0 and DL TCI state 1 till slot n+ THARQ +3

- be able to start receiving on DL TCI state 2 and DL TCI state 3 after slot n+ THARQ + + max{TOk1\*(Tfirst-SSB1 + AD1\*TSSB1 + TSSB-proc), TOk2\*(Tfirst-SSB2 + AD2\*TSSB2 + TSSB-proc)} / NR slot length

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

# <End of Change #2>