**3GPP TSG-RAN4 Meeting #** **111R4-2408570**

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

|  |
| --- |
| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **Draft** | **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 |  |

|  |
| --- |
|  |
| ***Title:***  | Draft CR on TC for FR1 TCI state switching for mDCI with two TA |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_MIMO\_evo\_DL\_UL-Perf |  | ***Date:*** | 2024-05-01 |
|  |  |  |  |  |
| ***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 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:*** | Define TC for joint TCI state switching mTCI FR1 with two TA when RTD is larger than CP.Add necessary TCI configuration and TRS configuration. |
|  |  |
| ***Summary of change:*** | * Add TC TC for joint TCI state switching mTCI FR1 with two TA when RTD is larger than CP.
* Add new TCI configurations.
* Add new TRS configurations.
 |
|  |  |
| ***Consequences if not approved:*** | The performance can not be verified. |
|  |  |
| ***Clauses affected:*** | A.3.16A.2, A.3.17 and A.6.5.X1 |
|  |  |
|  | **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>

Table A.3.16A.2-2: DLorJoint TCI States for mTRP FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | DLorJoint TCI.State.1.1 | DLorJoint TCI.State.1.2 | DLorJoint TCI.State.1.3 | DLorJoint TCI.State.1.4 |
| tci-StateUnifiedId | Id1 | Id2 | Id3 | Id4  |
| qcl-Type1 | typeA | typeA | typeC | typeC |
| qcl-Type2 | N/A | N/A | N/A | N/A |
| referenceSignal Note2 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 2 Note3 | SSB1  | SSB2  |
| pathlossReferenceRS | N/A | N/A | N/A | N/A |
| additionalPCI | N/A | N/A | N/A | N/A |
| Note 1: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.Note 2: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. The TCI state of the TRS is the DLorJoint TCI.State.1.1.Note 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. The TCI state of the TRS is the DLorJoint TCI.State.1.2. |

###  <End of Change 1>

###  <Start Change 2>

#### A.3.17.1.1 FDD

Table A.3.17.1.1-1: CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.1 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 211 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 casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.1-2: CSI-RS for tracking for SCS=30kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.2 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 221 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 casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.1-3: Aperiodic CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.3 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 23 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 casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.1-4: Aperiodic CSI-RS for tracking for SCS=30kHz

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.4 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 23 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 casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.1-5: CSI-RS for tracking for SCS=15kHz Set 1

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.5 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 211 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | DLorJoint TCI.State.1.3 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.1-6: CSI-RS for tracking for SCS=15kHz Set 2

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.6 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 211 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | DLorJoint TCI.State.1.4 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test casesNote 2: Unless otherwise specified in the test case |

#### A.3.17.1.2 TDD

Table A.3.17.1.2-1: CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 211 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |

Table A.3.17.1.2-2: CSI-RS for tracking for SCS=30kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.2 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 221 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 casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.2-3: Aperiodic CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.3 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 23 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |

Table A.3.17.1.2-4: Aperiodic CSI-RS for tracking for SCS=30kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.4 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 23 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 casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.2-5: CSI-RS for tracking for SCS=15kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 211 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | DLorJoint TCI.State.1.3 |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |

Table A.3.17.1.2-6: CSI-RS for tracking for SCS=15kHz Set 2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 211 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | DLorJoint TCI.State.1.4 |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |

Table A.3.17.1.2-7: CSI-RS for tracking for SCS=30kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.2 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 221 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | DLorJoint TCI.State.1.3 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test casesNote 2: Unless otherwise specified in the test case |

Table A.3.17.1.2-8: CSI-RS for tracking for SCS=30kHz Set 2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.2 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| 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 = 5 for CSI-RS resource 1 and 3l0 = 9 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 | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 221 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | DLorJoint TCI.State.1.3 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test casesNote 2: Unless otherwise specified in the test case |

###  <End of Change 2>

### <Start of Change 3>

### A.6.5.X1 Active TCI state switch delay

#### A.6.5.X1.1 MAC-CE based joint TCI state switch for mDCI with two TA when RTD is larger than CP

A.6.5.X1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.22.3. Supported test configuration is shown in Table A.6.5.X1.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) containing two TRPs (i.e., TRP 0 and TRP 1) belonging to two TAGs as given in Table A.6.5.X1.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.6.5.X1.1.1-3 below.

PDCCHs associated with corsetPoolIndex 0 and 1 indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending on PUCCH associated with TRP 0.

Before the test starts,

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

- UE is configured with 1 different TCI states associated with coresetPoolIndex 0 for PCell, PDCCH TCI state 0 (QCL’d to SSB0), in Cell 1 before starting the test. UE is configured with 2 TCI states associated with coresetPoolIndex 1 for PCell, PDCCH TCI state 0 (QCL’d to SSB1) and TCIstate 1 (QCL’d to SSB2),.

- UE is indicated in TCI state 0 as the active PDCCH TCI state for PDCCH associated with coresetPoolIndex 0, and UE is indicated in TCI state 0 as the active PDCCH TCI state for PDCCH associated with coresetPoolIndex 1.

- Target TCI state is not in the active TCI state list.

The test consists of two time periods, T1 and T2. During T1 only SSB0 and SSB2 are transmitted. At the beginning of T2, the SSB1 corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1 for PDCCH associated with coresetPoolIndex 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 associated with coresetPoolIndex 0 till n+ THARQ +3 ms. The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 associated with coresetPoolIndex 0 after n+ THARQ +3 ms + (Tfirst-SSB + TSSB-proc).

Table A.6.5.X1.1.1-1: Supported test configurations

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

Table A.6.5.X1.1.1-2: General test parameters for TCI state switch

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| Timing offset between SSB 0 and SSB1 | us | [25] |  |
| Timing offset between SSB0 and SSB2  | us | [33] |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

Table A.6.5.X1.1.1-3: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** |
| Frequency Range |  | FR1 |
| Duplex mode | Config 1 |  | FDD |
|  | Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
|  | Config 2 |  | TDDConf.1.1 |
|  | Config 3 |  | TDDConf.1.2 |
| BWchannel | Config 1,2 |  | 10: NRB,c = 52 |
|  | Config 3 |  | 40: NRB,c = 106 |
| DL initial BWP configuration | Config 1, 2, 3 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 |  | ULBWP.1.1 |
| PDSCH Reference  | Config 1 |  | SR.1.1 FDD |
| measurement channel Note 4 | Config 2 |  | SR.1.1 TDD |
|  | Config 3 |  | SR.2.1 TDD |
| RMSI CORESET  | Config 1 |  | CR.1.1 FDD |
| parameters | Config 2 |  | CR.1.1 TDD |
|  | Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET  | Config 1 |  | CCR.1.2 FDD |
| parameters | Config 2 |  | CCR.1.2 TDD |
|  | Config 3 |  | CCR.2.4 TDD |
| TRS Configuration for TRP 0  | Config 1 |  | TRS.1.1 FDD |
| Config 2 |  | TRS.1.1 TDD |
| Config 3 |  | TRS.1.2 TDD |
| TRS Configuration for TRP 1 Set 1 | Config 1 |  | TRS.1.5 FDD |
| Config 2 |  | TRS.1.5 TDD |
| Config 3 |  | TRS.1.7 TDD |
| TRS Configuration for TRP 1 Set 2 | Config 1 |  | TRS.1.6 FDD |
| Config 2 |  | TRS.1.6 TDD |
| Config 3 |  | TRS.1.8 TDD |
| OCNG Patterns | Config 1,2 |  | OP.1 |
|  | Config 3 |  | OP.1 |
| SSB Configuration for TRP 0 | Config 1,2 |  | SSB.2 FR1 |
|  | Config 3 |  | SSB.4 FR1 |
| SSB Configuration for TRP 1 | Config 1,2 |  | SSB.7 FR1 |
| Config 3 |  | SSB.8 FR1 |
| TCI state 0 associated with coresetPoolIndex 0  |  |  | DLorJoint TCI.State.0 |
| TCI state 0 associated with coresetPoolIndex 1 |  |  | DLorJoint TCI.State.6 |
| TCI state 1 associated with coresetPoolIndex 1 |  |  | DLorJoint TCI.State.7 |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |
| EPRE ratio of PDSCH DMRS to SSS  |  |  |
| EPRE ratio of PDSCH to PDSCH  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |
| NocNote 2 | Config 1,2 | dBm/SCS | -104 |
|  | Config 3 |  | -101 |
| NocNote 2 | dBm/15KHz | -104 |
| SS-RSRP Note 3 | Config 1,2 | dBm/SCS | -87 |
|  | Config 3 |  | -84 |
| Ês/Iot | dB | 17 |
| Ês/Noc | dB | 17 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -58.96 |
|  | Config 3 | dBm/38.16MHz | -52.86 |
| Propagation Condition  |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 4 PDSCH RMC for TRP0 and TRP1 are scheduled in non-overlapping RBs |

A.6.5.X1.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall be able to continue receive on TRP 0, and for TRP 1, UE shall:

- be able to continue to receive on TCI state 0 till n+ THARQ +3 ms

- be able to start receiving on TCI state 1 after n+ THARQ +5 ms + Tfirst-SSB

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

###  <End of Change 3>