**3GPP TSG-RAN4 Meeting # 111**  ***R4-2410386***

**Fukouka, Japan, 20th May - 24th May**

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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:*** | ( NR\_NTN\_enh-Perf) draft CR on Radio Link Monitoring test for NTN | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NTN\_enh-Perf | | | | |  | ***Date:*** | | | 2024-05-06 |
|  |  | | | |  | |  | | |  |
| ***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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. Add test case for RLM configured with SSB, no DRX, for NTN Above 10 GHz. 2. Add configurations for RMC and CSI-RS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Add test case for RLM configured with SSB, no DRX, for NTN Above 10 GHz. 2. Add configurations for RMC and CSI-RS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | 1. No test case for RLM for NTN Above 10 GHz. 2. No correct configurations for RMC and CSI-RS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.14.X.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Use temporary clause number: A.1X.4 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

Start of Change 1

### A.14.X.1 Radio link Monitoring

#### A.14.X.1.1 Radio Link Monitoring Out-of-sync Test for FR2 SAN PCell configured with SSB-based RLM RS in non-DRX mode

##### A.14.X.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the SAN PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1C.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.14.X.1.1.1-1. The test parameters are given in Tables A.14.X.1.1.1-2, A.14.X.1.1.1-3, and A.14.X.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.14.X.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

The UE shall be provided with the valid information about the SAN serving each cell in the test before the test.

Table A.14.X.1.1.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | NGSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.14.X.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| NTN reference configuration | | Config 1 |  | TBD |
| Config 2 | TBD |
| BWchannel | | Config 1, 2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | [CR.2.1 FDD] |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | [CCR.2.1 FDD] |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 kHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 2 |  | [CSI-RS.2.1 FDD] |
| CSI-RS for tracking | | Config 1, 2 |  | [TRS.2.1 FDD] |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.14.X.1.1.1-3: Cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| AoA setup | |  | TBD | | |
| Assumption for UE beams | |  | TBD | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1 | dB | 2 | -6 | -15 |
|  | Config 2 |  | 2 | -6 | -15 |
|  | Config 1 | dBm/15kHz | -92.1 | | |
|  | Config 2 |  | -92.1 | | |
| Propagation condition | |  | TBD | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1C.1.1-1. | | | | | |

Table A.14.X.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
|  | Value |
| gapOffset | 0 |

A diagram of a diagram

Description automatically generated

Figure A.14.X.1.1.1-1: SNR variation for out-of-sync testing

##### A.14.X.1.1.2 Test Requirements

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

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

#### A.14.X.1.2 Radio Link Monitoring In-sync Test for FR2 SAN PCell configured with SSB-based RLM RS in non-DRX mode

##### A.14.X.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the SAN PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1C.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.14.X.1.2.1-1. The test parameters are given in Tables A.14.X.1.2.1-2, and A.14.X.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.14.X.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with the valid information about the SAN serving the each cell in the test before the test.

Table A.14.X.1.2.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | NGSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.14.X.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| NTN reference configuration | | Config 1 |  | TBD |
| Config 2 | TBD |
| BWchannel | | Config 1, 2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | [CR.2.1 FDD] |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | [CCR.2.1 fDD] |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 kHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 1000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | |  | [CSI-RS.2.1 FDD] |
| CSI-RS for tracking | Config 1, 2 | |  | [TRS.2.1 FDD] |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.24 |
| T4 | | | s | 0.2 |
| T5 | | | s | 0.88 |
| D1 | | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.14.X.1.2.1-3: Cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | TBD | | | | |
| Assumption for UE beams | |  | TBD | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 2 | -6 | -15 | -4.5 | 2 |
|  | Config 2 |  | 2 | -6 | -15 | -4.5 | 2 |
|  | Config 1 | dBm/15 kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 1 | dBm/SCS | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
| Propagation condition | |  | TBD | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1C.2.1-1. | | | | | | | |

A diagram of a diagram

Description automatically generated

Figure A.14.X.1.2.1-1: SNR variation for in-sync testing

##### A.14.X.1.2.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

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

End of Change 1

Start of Change 2

#### A.3.1.2.1 FDD

Table A.3.1.2.1-1: RMSI CORESET Reference Channel for FDD with SCS=15KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.1.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case |  |  |  |  |  |  |
| Subcarrier spacing for RMSI CORESET | kHz | 15 |  |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 |  |  |  |  |  |  |
| Subcarrier spacing for SSB | kHz | 15 |  |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration Note 7 |  | Pattern 1 |  |  |  |  |  |  |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note8) |  |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of RMSI CORESET Note 7 | symbols | 2 |  |  |  |  |  |  |
| DCI Format Note 1 |  | Note 2 |  |  |  |  |  |  |
| Aggregation level | CCE | 8 |  |  |  |  |  |  |
| DMRS precoder granularity |  | 6 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| Mapping from REG to CCE |  | Distributed |  |  |  |  |  |  |
| Cell ID |  | Note 5 |  |  |  |  |  |  |
| Payload (without CRC) | bits | Note 6 |  |  |  |  |  |  |
| Note 1: DCI formats are defined in TS 38.212.  Note 2: DCI format shall depend upon the test configuration.  Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.  Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].  Note 5: Cell ID shall depend upon the test configuration.  Note 6: Payload size shall depend upon the test configuration.  Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3]  Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC. | | | | | | | | |

Table A.3.1.2.1-2: RMSI CORESET Reference Channel for FDD with SCS=120KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.2.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |  |  |
| Subcarrier spacing for RMSI CORESET | kHz | 120 |  |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 |  |  |  |  |  |  |
| Subcarrier spacing for SSB | kHz | 120 |  |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration Note 7 |  | Pattern 1 |  |  |  |  |  |  |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note8) |  |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of RMSI CORESET Note 7 | symbols | 2 |  |  |  |  |  |  |
| DCI Format Note 1 |  | Note 2 |  |  |  |  |  |  |
| Aggregation level | CCE | 8 |  |  |  |  |  |  |
| DMRS precoder granularity |  | 6 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| Mapping from REG to CCE |  | Distributed |  |  |  |  |  |  |
| Cell ID |  | Note 5 |  |  |  |  |  |  |
| Payload (without CRC) | bits | Note 6 |  |  |  |  |  |  |
| Note 1: DCI formats are defined in TS 38.212.  Note 2: DCI format shall depend upon the test configuration.  Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.  Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-12 in TS 38.213 [3].  Note 5: Cell ID shall depend upon the test configuration.  Note 6: Payload size shall depend upon the test configuration.  Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [3]  Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC. | | | | | | | | |

End of Change 2

Start of Change 3

### A.3.1.3 CORESET for RMC scheduling

#### A.3.1.3.1 FDD

Table A.3.1.3.1-1: Control Channel RMC for FDD with SCS=15KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.1.1 FDD | CCR.1.2 FDD | CCR.1.3 FDD | CCR.1.4 FDD | CCR.1.5 FDD |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case | 10 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 18 | 24 | 18 | 24 |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 | 1 |  |  |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 | 2 |  |  |
| monitoringSymbolsWithinSlot |  | 1000000  0000000 | 1000000  0000000 | 1000000  0000000 | 1000000  0000000 | 0010000  0000000 |  |  |
| REG bundle size |  | 6 | 6 | 6 | 6 | 6 |  |  |
| DMRS precoder granularity |  | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved |  |  |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 | 0 |  |  |
| Interleave size |  | 2 | 2 | 2 | 2 | 2 |  |  |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A | N/A |  |  |
| Aggregation level | CCE | 4 | 2 | 8 | 4 | 4 |  |  |
| DCI formats |  | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 |  |  |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |  |  |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration  Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | | | |

Table A.3.1.3.1-2: Control Channel RMC for FDD with SCS=120KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.2.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of CORESET | symbols | 1 |  |  |  |  |  |  |
| monitoringSlotPeriodicityAndOffset Note 4 |  | sl160  0 |  |  |  |  |  |  |
| monitoringSymbolsWithinSlot |  | 1100000  0000000 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| DMRS precoder granularity |  | Same as REG bundle size |  |  |  |  |  |  |
| CCE to REG mapping |  | Interleaved |  |  |  |  |  |  |
| Interleave n\_shift |  | 0 |  |  |  |  |  |  |
| Interleave size |  | 2 |  |  |  |  |  |  |
| Beamforming Pre-Coder |  | N/A |  |  |  |  |  |  |
| Aggregation level | CCE | 4 |  |  |  |  |  |  |
| DCI formats |  | Note 1 |  |  |  |  |  |  |
| Payload size (without CRC) | bits | Note 2 |  |  |  |  |  |  |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration.  Note 3: Allocated in the resource blocks where the associated RMC is scheduled.  Note 4: *monitoringSlotPeriodicityAndOffet* is set to “sl1 0” if it is specifically stated that cell(s) configured with one of the control channel RMCs above shall transmit PDCCHs continuously. | | | | | | | | |

End of Change 3

Start of Change 4

## A.3.14 CSI-RS configurations

### A.3.14.1 FDD

Table A.3.14.1-1: CSI-RS Reference Measurement Channels for SCS=15kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CSI-RS.1.1 FDD** | **CSI-RS.1.2 FDD** | **CSI-RS.1.3 FDD** | **CSI-RS.1.4 FDD** | **CSI-RS.1.5 FDD** | **CSI-RS.1.6 FDD** | **CSI-RS.1.7 FDD** |
| **Resource Type** | **periodic** | **periodic** | **aperiodic** | **aperiodic** | **aperiodic** | **periodic** | **periodic** |
| **Resource Set Config** |  |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | 0 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |  |  |
|  |  | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |  | 2 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |  |
|  |  |  |  | 2 for resource #2 |  |  |
|  |  |  |  | 3 for resource #3 |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 1 for resource #1 | 0 for resource #0 | 3 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |  |
|  |  |  |  | 6 for resource #6 |  |  |
|  |  |  |  | 7 for resource #7 |  |  |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. | n.a. | slot40 | slot10 |
| Offset | 1 | 1 | n.a. | n.a. | n.a. | 1 | 1 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
|  |  | TCI.State.1 |  |  |  |  | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
|  |  | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 |  | 6 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |  |  |
|  |  |  |  | 2 for resource #2 |  |  |  |
|  |  |  |  | 3 for resource #3 |  |  |  |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | n.a. | 5 for resource #0 | 10 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |  |  |
|  |  |  |  | 6 for resource #6 |  |  |  |
|  |  |  |  | 7 for resource #7 |  |  |  |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | | | |

Table A.3.14.1-2: CSI-RS Reference Measurement Channels for SCS=120kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CSI-RS.2.1 FDD** |  |  |  |  |  |  |
| **Resource Type** | **periodic** |  |  |  |  |  |  |
| **Resource Set Config** |  |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 |  |  |  |  |  |  |
| repetition | n.a. |  |  |  |  |  |  |
| aperiodicTriggeringOffset | n.a. |  |  |  |  |  |  |
| trs-Info | n.a. |  |  |  |  |  |  |
| **Resource Config** |  |  |  |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 |  |  |  |  |  |  |
| powerControlOffset | 0 |  |  |  |  |  |  |
| powerControlOffsetSS | db0 |  |  |  |  |  |  |
| scramblingID | 0 |  |  |  |  |  |  |
| Period (slots) | slot40. |  |  |  |  |  |  |
| Offset | 8 |  |  |  |  |  |  |
| qcl-InfoPeriodicCSI-RS | TCL.State.0 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| frequencyDomainAllocation | 000001 |  |  |  |  |  |  |
| nrofPorts | 2 |  |  |  |  |  |  |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 |  |  |  |  |  |  |
| cdm-Type | FD-CDM2 |  |  |  |  |  |  |
| density | 1 |  |  |  |  |  |  |
| startingRB | 0 |  |  |  |  |  |  |
| nrofRBs | 276 (Note 1) |  |  |  |  |  |  |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | | | |

End of Change 4

Start of Change 5

### 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. | | |

#### A.3.17.2.2 FDD

Table A.3.17.2.2-1: CSI-RS for tracking for SCS=120kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.1 FDD |
| 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. | | |

End of Change 5