**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***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 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:*** | The PMI reporting requirements for FR2 multipanel reception agreed to be defined |
|  |  |
| ***Summary of change:*** | Update existing test• Update Chapter 8.1.1.3 for optional UE feature• Add new Chapter 8.1.1.7 for optional UE feature• Update Chapter 8.3.3.2.2 |
|  |  |
| ***Consequences if not approved:*** | The performance requirements for FR2 multipanel reception will be incomplete |
|  |  |
| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.521-4 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | Endorsed draft CR R4-2406010 |
|  |  |
| ***This CR's revision history:*** | Revision of R4-2409487 |

**START OF CHANGE 1**

#### 8.1.1.3 Applicability of requirements for optional UE features

The performance requirements in Table 8.1.1.3-1 shall apply for UEs which support optional UE features only.

Table 8.1.1.3-1: Requirements applicability for optional UE features

|  |  |  |  |
| --- | --- | --- | --- |
| UE feature/capability [14] | Test type | Test list | Applicability notes |
| 256QAM modulation scheme for PDSCH for FR2 (*pdsch-256QAM-FR2*) | FR2 TDD | CQI | Clause 8.2.2.2. 2.1 (Tests 3 and 4) | The test coverage can be considered fulfilled without executing of Test 1 and 2 from Clause 8.2.2.2. 2.1 if UE passes Test 3 and 4 from Clause 8.2.2.2.2.1 |
| Support of 2-port DL PTRS (*supportTwoPortDL-PTRS-r16*) | FR2TDD | PMI | Clause 8.3.3.2.2 (Test 2) | The test coverage can be considered fulfilled without executing of Test 2 from Clause 8.3.3.2.2 if UE passes Test 1 from Clause 8.3.3.2.2 |
| Support of single-DCI based SDM scheme (*singleDCI-SDM-scheme-r16*) | FR2 TDD | PMI | Clause 8.3.3.2.2 (Tests 1 and 2) |  |
| Support simultaneous reception with different QCL Type-D RSs (*simultaneousReceptionDiffTypeD-r16*) | FR2 TDD | PMI | Clause 8.3.3.2.2 (Tests 1 and 2) |  |
| Support of CSI Enhancement for Multi-TRP (*mTRP-CSI-EnhancementPerBand-r17*) | FR2 TDD | PMI | Clause 8.3.3.2.2 (Tests 1 and 2) |  |

**END OF CHANGE 1**

**START OF CHANGE 2**

8.1.1.7 Applicability of different requirements with simultaneous reception

The applicability rules for different requirements with simultaneous reception of multiple transmit points in section 8 are specified in Table 8.1.1.7-1.

Table 8.1.1.7-1: Applicability of different requirements with simultaneous reception

|  |  |  |
| --- | --- | --- |
| If UE has passed | UE can skip | Applicability notes |
| Test type | Test list | Test type | Test list |
| FR2 TDD | PMI | Clause 8.3.3.2.2 (Test 2) | FR2 TDD | PMI | Clause 8.3.3.2.2 (Test 1) | If UE supports one PTRS port per TRxP configuration, UE is not tested for one PTRS port across TRxPs;  |

**END OF CHANGE 2**

**START OF CHANGE 3**

##### 8.3.3.2.2 Single PMI with 2 ports TypeI-SinglePanel Codebook for Single-DCI based transmission scheme with simultaneous reception

For the parameters specified in Table 8.3.3.2.2-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 8.3.3.2.2-2.

Table 8.3.3.2.2-1: Test parameters (dual-layer)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| TRxP #1(Note 1) | TRxP #2(Note 1) |
| SSB |  | SSB#0 | SSB#1 |
| PDCCH configuration | TCI state |  | TCI State #2 | N/A |
| CORESETPoolIndex |  | 0 | N/A |
| CSI-RS for tracking | First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resources 1,2,3,4 | k0=1 for CSI-RS resources 5,6,7,8 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 4 for CSI-RS resources 1 and 3l0 = 8 for CSI-RS resources 2 and 4 | l0 = 4 for CSI-RS resources 5 and 7l0 = 8 for CSI-RS resources 6 and 8 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 5,6,7,8 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4,5,6,7,8 |
| Density |  | 3 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 80 for CSI-RS resources 1 and 281 for CSI-RS resources 3 and 4 | 80 for CSI-RS resources 5 and 681 for CSI-RS resources 7 and 8 |
| QCL info |  | TCI state #0 | TCI state #1 |
| CSI-RS for beam refinement | First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resources 1 and 2 | k0=1 for CSI-RS resources 3 and 4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 8 for CSI-RS resource 1l0 = 9 for CSI-RS resource 2 | l0 = 8 for CSI-RS resource 3l0 = 9 for CSI-RS resource 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resources 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resources 1,2,3,4 |
| Density |  | 3 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 for CSI-RS resources 1,2,3,4 |
| QCL info |  | TCI state #2 | TCI state #3 |
| Duplex mode |  | TDD |
| Bandwidth | MHz | 100 |
| Subcarrier spacing | kHz | 120 |
| TDD DL-UL configurations |  | FR1.120-1 as specified in Annex A.1.3 |
| Active DL BWP index |  | 1 |
| Propagation channel |  | TDLA30-35 |
| Correlation matrix and antenna configuration (Note 6) |  | 4x4 FR2- mTRxP-mRXρ = -12dB |
| Beamforming Model |  | As specified in Annex B.4.1 (Note 4) |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S)  |  | 2 |
| Length (L) |  | 12 |
| PRB bundling type |  | Static |
| PRB bundling size |  | 2 |
| Resource allocation type |  | Type 1 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | Antenna port indexes |  | 1000  | 1002 |
| TCI state |  | TCI State #0 | TCI State #1 |
| DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| PTRS configuration(Note 5) | Frequency density (*KPT-RS*) |  | 2 | Test 1: N/ATest 2: 2 |
| Time density (*LPT-RS*) |  | 1 | Test 1: N/ATest 2: 1 |
| Resource Element Offset |  | 2 | Test 1: N/ATest 2: 3 |
| TCI State #0 | Type 1 QCL information | SSB index |  | SSB #0 | N/A |
| QCL Type |  | Type C | N/A |
| Type 2 QCL information | SSB index |  | SSB #0 | N/A |
| QCL Type |  | Type D | N/A |
| TCI State #1 | Type 1 QCL information | SSB index |  | N/A | SSB #1 |
| QCL Type |  | N/A | Type C |
| Type 2 QCL information | SSB index |  | N/A | SSB #1 |
| QCL Type |  | N/A | Type D |
| TCI State #2 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking’ configuration | N/A |
| QCL Type |  | Type A | N/A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking’ configuration | N/A |
| QCL Type |  | Type D | N/A |
| TCI State #3 | Type 1 QCL information | CSI-RS resource |  | N/A | CSI-RS resource 5 from 'CSI-RS for tracking’ configuration |
| QCL Type |  | N/A | Type A |
| Type 2 QCL information | CSI-RS resource |  | N/A | CSI-RS resource 5 from 'CSI-RS for tracking’ configuration |
| QCL Type |  | N/A | Type D |
| Resource allocation |  | Full-overlapping |
| Timing offset of the second TRxP from the first TRxP | us | 0 |
| Frequency offset of the second TRxP from the first TRxP | Hz | 0 |
| Number of HARQ Processes |  | 8  |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | Specific to each TDD UL-DL pattern and as defined in Annex A.1.3 |
| ZP CSI-RS configuration | CSI-RS resource Type |  | Periodic |
| Number of CSI-RS ports (*X*) |  | 4 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 4, (8,-) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (13) |
| CSI-RSperiodicity and offset | slot | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource ID |  | Resource #9 | Resource #10 |
| CSI-RS resource Type |  | Aperiodic | Aperiodic |
| Number of CSI-RS ports (*X*) |  | 2 | 2 |
| CDM Type |  | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 3, (8,-) | Row 3, (10,-) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (12)  | (12) |
| CSI-RSperiodicity and offset | slot | Not configured | Not configured |
| aperiodicTriggeringOffset |  | 0 | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 1 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (8,13) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| reportQuantity |  | cri-RI-PMI-CQI |
| csi-ReportMode |  | Mode1 |
| numberOfSingleTRP-CSI-Mode1 |  | $$X=0$$ |
| CMR pairing and grouping  |  | CMR group #1: {NZP CSI-RS resource #9}, with $K\_{1}=1$CMR group #2: {NZP CSI-RS resource #10}, with $K\_{2}=1$CMR paring: {NZP CSI-RS resource #9, NZP CSI-RS resource #10} |
| timeRestrictionForChannelMeasurements |  | Not configured |
| timeRestrictionForInterferenceMeasurements |  | Not configured |
| cqi-FormatIndicator |  | Wideband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 8 |
| csi-ReportingBand |  | 1111111 |
| CSI-Report periodicity and offset | slot | Not configured |
| Aperiodic Report Slot Offset |  | 8 |
| CSI request |  | 1 in slots i, where mod(i, 5) = 1, otherwise it is equal to 0 |
| reportTriggerSize |  | 1 |
| CSI-AperiodicTriggerStateList |  | One State with one Associated Report ConfigurationAssociated Report Configuration contains pointers to NZP CSI-RS and CSI-IM |
| Codebook configuration  | CodebookType |  | typeI-SinglePanel |
| CodebookMode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (1,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (1,1) |
| CodebookSubsetRestriction |  | 001111 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 1.75 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | Test 1:R.PDSCH.5-7.2 TDDTest 2:R.PDSCH.5-7.3 TDD |
| PDSCH & PDSCH DMRS Precoding configuration for random Precoding |  | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with Wideband granularity |
| Note 1: PDSCH transmission is done from both TRxPs (PDSCH Layer 0 is transmitted from TRxP #1 and PDSCH layer 1 is transmitted from TRxP #2)Note 2: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (0.125 ms granularity) with equal probability of each applicable i1, i2 combination.Note 3: If the UE reports in an available uplink reporting instance at slot#n based on PMI estimation at a downlink slot not later than slot#(n-4), this reported PMI cannot be applied at the gNB downlink before slot#(n+4).Note 4: Randomization of the beam direction per TRxP shall be used as specified in Annex B.2.3.2.3.Note 5: PT-RS configuration in Test 1 uses single port (one TRxP) and Test 2 used dual port (both TRxPs)Note 6: Correlation matrix according to the RFR2-mTxRP-mRX in B.2.3.3. TRxP#1 uses TX antenna indices (1,2) and TRxP#2 uses TX antenna indices (3,4) corresponding to the respective antenna configuration matrix rows |

Table 8.3.3.2.2-2: Minimum requirement

|  |  |  |
| --- | --- | --- |
| Parameter | Test 1 | Test 2 |
| *g* | 1.15 | 1.15 |

**END OF CHANGE 3**