**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **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:*** |  | | | | | | | | | |
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| ***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 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:*** | | 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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**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*) | FR2  TDD | 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 3  l0 = 8 for CSI-RS resources 2 and 4 | | l0 = 4 for CSI-RS resources 5 and 7  l0 = 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 2  81 for CSI-RS resources 3 and 4 | | 80 for CSI-RS resources 5 and 6  81 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 1  l0 = 9 for CSI-RS resource 2 | | l0 = 8 for CSI-RS resource 3  l0 = 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-mRX  ρ = -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/A  Test 2: 2 |
| Time density (*LPT-RS*) | | | |  | 1 | | Test 1: N/A  Test 2: 1 |
| Resource Element Offset | | | |  | 2 | | Test 1: N/A  Test 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity and offset | | | slot | Not configured | | |
| ReportConfigType | | | | |  | Aperiodic | | |
| CQI-table | | | | |  | Table 1 | | |
| reportQuantity | | | | |  | cri-RI-PMI-CQI | | |
| csi-ReportMode | | | | |  | Mode1 | | |
| numberOfSingleTRP-CSI-Mode1 | | | | |  |  | | |
| CMR pairing and grouping | | | | |  | CMR group #1: {NZP CSI-RS resource #9}, with  CMR group #2: {NZP CSI-RS resource #10}, with  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 Configuration  Associated 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 TDD Test 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 principle 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**