**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | **1** | **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:***  | CR for Rel-18 TS38.101-4, alignments on the expression of CSI-RS conigurations for 8Rx CQI requirements |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***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)* |
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| ***Reason for change:*** | Taking the following table as an exampe, in TS38.101-4, the expression for configuraitons of ZP CSI-RS and NZP CSI-RS are differnet in CQI, PMI and RI requirements.

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| --- | --- | --- | --- |
| Table 6.2.2.1.1.3-1 (CQI requirement) | ZP CSI-RS configuration | First subcarrier index in the PRB used for CSI-RS (k0) | Row 5,4 |
| First OFDM symbol in the PRB used for CSI-RS (l0) | 9 |
| NZP CSI-RS for CSI acquisition | First subcarrier index in the PRB used for CSI-RS (k0) | Row 3,(6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) | 13 |
| Table 6.3.2.1.3-1 (PMI requirement) | ZP CSI-RS configuration | First subcarrier index in the PRB used for CSI-RS (k0, k1) | Row 5, (4,-) |
| First OFDM symbol in the PRB used for CSI-RS (l0, l1) | (9,-) |
| NZP CSI-RS for CSI acquisition | First subcarrier index in the PRB used for CSI-RS (k0, k1, k2, k3) | Row 12, (2, 4, 6, 8) |
| First OFDM symbol in the PRB used for CSI-RS (l0, l1) | (5, -) |
| Table 6.4.2.1-1 (RI requirement) | ZP CSI-RS configuration | First subcarrier index in the PRB used for CSI-RS (k0) | Row 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) | (9) |
| NZP CSI-RS for CSI acquisition | First subcarrier index in the PRB used for CSI-RS (k0) | Row 3 (6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) | (13) |

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| ***Summary of change:*** | 1. Align the expression for configuraitons of ZP CSI-RS and NZP CSI-RS in Caluse 6.2.4 with that in other Clauses
2. Add row configuration for the “First OFDM symbol in the PRB used for CSI-RS” to be aligned with “First subcarrier index in the PRB used for CSI-RS”
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|  |  |
| ***Consequences if not approved:*** | The expression for configuraitons of ZP CSI-RS and NZP CSI-RS are not aligned |
|  |  |
| ***Clauses affected:*** | 6.2.4 |
|  |  |
|  | **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:*** | Revision of R4-2418120 |

**START OF CHANGE 1**

### 6.2.4 8RX requirements

This sub-clause includes the requirements for reporting of CQI for UE equipped with 8 receiver antennas.

#### 6.2.4.1 FDD

##### 6.2.4.1.1 CQI reporting definition under AWGN conditions

The reporting accuracy of CQI under AWGN condition is determined by the reporting variance and BLER performance using the transport format indicated by the reported CQI median. The purpose of the requirements is to verify that the reported CQI values are in accordance with the CQI definition given in TS 38.214 [12]. To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

###### 6.2.4.1.1.1 Minimum requirement for period CQI reporting

For the parameters specified in Table 6.2.4.1.1.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified by the following:

a) The reported CQI value according to the reference channel shall be in the range of ±1 of the reported median more than 90 % of the time.

b) If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, then the BLER using the transport format indicated by the (median CQI+1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, then the BLER using transport format indicated by (median CQI-1) shall be less than or equal to 0.1.

Table 6.2.4.1.1.1-1: CQI reporting definition test

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| SNR |  dB | 4 | 5 | 10 | 11 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 4×8 with static channel specified in Annex B.1 |
| Beamforming Model |  | As specified in Annex B.4.1 |
| 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 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | Row 5,(9) |
| CSI-RSperiodicity and offset | slot | 5/1 |
| NZP CSI-RS for CSI acquisition | 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,(0) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | Row 4,(13) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | 5/1 |
| CSI-IM configuration | CSI-IM resource Type |  | Periodic |
| CSI-IM RE pattern |  | 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4, 9) |
| CSI-IM timeConfigperiodicity and offset | slot | 5/1 |
| ReportConfigType |  | Periodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| 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 | 5/0 |
| aperiodicTriggeringOffset |  | Not configured |
| Codebook configuration (Note 1) | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1, CodebookConfig-N2) |  | (2,1) |
| (CodebookConfig-O1, CodebookConfig-O2) |  | (4,1) |
| two-one-TypeI-SinglePanel-Restriction |  | 00000001 |
| RI Restriction |  | 00001000 |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Number of HARQ Processes |  | 4 |
| Measurement channel |  | As specified in Table A.4-3, TBS.3-2 |
| Note 1: The PMI associated to i2 = 0 is always used as the precoder regardless of the reported i2 value. |

#### 6.2.4.2 TDD

##### 6.2.4.2.1 CQI reporting definition under AWGN conditions

6.2.4.2.1.1 Minimum requirement for periodic CQI reporting

The purpose of the requirements is to verify that the reported CQI values are in accordance with the CQI definition given in TS 38.214 [12]. The reporting accuracy of CQI under AWGN condition is determined by the reporting variance and BLER performance using the transport format indicated by the reported CQI median. To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

For the parameters specified in Table 6.2.4.2.1.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified by the following:

a) The reported CQI value according to the reference channel shall be in the range of ±1 of the reported median more than 90% of the time.

b) If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, then the BLER using the transport format indicated by the (median CQI+1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, then the BLER using transport format indicated by (median CQI-1) shall be less than or equal to 0.1.

Table 6.2.4.2.1.1-1: CQI reporting definition test

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 40 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD UL-DL pattern |  | FR1.30-1 |
|  SNR |  dB | 4 | 5 | 10 | 11 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 4x8 with static channel specified in Annex B.1 |
| Beamforming Model |  | As specified in Annex B.4.1 |
| 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 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | Row 5,(9) |
| CSI-RSperiodicity and offset | slot | 10/1 |
| NZP CSI-RS for CSI acquisition | 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,(0) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | Row 4,(13) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | 10/1 |
| CSI-IM configuration | CSI-IM resource Type |  | Periodic  |
| CSI-IM RE pattern |  | 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4, 9) |
| CSI-IM timeConfigperiodicity and offset | slot | 10/1 |
| ReportConfigType |  | Periodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | Not configured |
| timeRestrictionForInterferenceMeasurements |  | Not configured |
| cqi-FormatIndicator |  | Wideband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 16 |
| csi-ReportingBand |  | 1111111 |
| CSI-Report periodicity and offset | slot | 10/9 |
| aperiodicTriggeringOffset |  | Not configured |
| Codebook configuration (Note 1) | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1, CodebookConfig-N2) |  | (2,1) |
| (CodebookConfig-O1, CodebookConfig-O2) |  | (4,1) |
| two-one-TypeI-SinglePanel-Restriction |  | 00000001 |
| RI Restriction |  | 00001000 |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Number of HARQ Processes |  | 8 |
| Measurement channel |  | As specified in Table A.4-3, TBS.3-4 |
| Note 1: The PMI associated to i2 = 0 is always used as the precoder regardless of the reported i2 value. |

**END OF CHANGE 1**