**3GPP TSG-RAN WG4 Meeting #100-e *R4-2115854***

**Electronic meeting, August 16-27, 2021**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-4** | **CR** | **0270** | **rev** | **-** | **Current version:** | **15.10.0** |  |
|  |
| *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:***  |  |
|  |  |
| ***Source to WG:*** | MCC, Intel Corporation |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Perf |  | ***Date:*** | 2021-08-29 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | This big CRs merge the multiple endorsed draft CRs. The reason for change in each endorsed draft CR is copied below.**R4-2111893 CR to RI reporting parameter settings**Current CSI-IM resource Type does not match with its supposed periodicity and offset set to be “not configured”**R4-2111896 CR to reporting granularity for PMI TCs**Although reporting granularity for PMI TC was assumed to use Wide-band in way forward (R4-1811693) at RAN4#88, it is unclear in PMI TCs.**R4-2115668 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-15**Several parameter configurations and PMI gamma formula is not correct |
|  |  |
| ***Summary of change:*** | The summary of change in each endorsed draft CR is copied below.**R4-2111893 CR to RI reporting parameter settings**Corrected typo on CSI-IM resource Type: Periodic -> Aperiodic in Table 8.4.2.2-1**R4-2111896 CR to reporting granularity for PMI TCs**PDSCH & PDSCH DMRS precoding configuration for ramdom precoding are added to test parameters in PMI TCs.**R4-2115668 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-15**Correction of some of the parameter configuraions and formula |
|  |  |
| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR are copied below.**R4-2111893 CR to RI reporting parameter settings**Conformance Test cannot be correctly performed.**R4-2111896 CR to reporting granularity for PMI TCs**Reporting granularity remains unclear.**R4-2115668 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-15**Several parameter configurations and the formula for PMI gamma is not correct |
|  |  |
| ***Clauses affected:*** | The clauses affected in each endorsed draft CR are copied below.**R4-2111893 CR to RI reporting parameter settings**8.4.2.2**R4-2111896 CR to reporting granularity for PMI TCs**6.3.2.1.1, 6.3.2.1.2, 6.3.2.2.1, 6.3.2.2.2, 6.3.3.1.1, 6.3.3.1.2, 6.3.3.2.1, 6.3.3.2.2**R4-2115668 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-15**6.2, 6.3, 6.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.521-4 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

***<Start of change1>***

Table 6.2.2.1.1.1-1: CQI reporting definition test

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Duplex Mode |  | FDD |
| Subcarrier spacing | kHz | 15 |
| SNR | dB | 8 | 9 | 14 | 15 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 2×2 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 010000 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-2 |

***<End of change1>***

***<Start of change2>***

Table 6.2.2.1.2.1-1: Wideband CQI reporting test under frequency non-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
|  SNR |  dB | 6 | 7 | 12 | 13 |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | 2×2  |
| Correlation configuration |  | ULA high |
| 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-1 |

***<End of change2>***

***<Start of change3>***

Table 6.2.2.1.2.2-1: Sub-band CQI reporting test under frequency-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| SNR |  dB | 8 | 9 | 14 | 15 |
| Propagation channel |  | Two tap model specified in Annex B.2.4 with *a*=1, *f*D = 5Hz, and τd=0.45μs |
| Antenna configuration |  | 2×2 |
| Correlation configuration |  | As per 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 |  | Aperiodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | Not configured |
| timeRestrictionForInterferenceMeasurements |  | Not configured |
| cqi-FormatIndicator |  | Subband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 8 |
| csi-ReportingBand |  | 1111111 |
| CSI-Report periodicity and offset | slot | Not configured |
| Aperiodic Report Slot Offset |  | 5 |
| 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 |
| aperiodicTriggeringOffset |  | Not configured |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-5 |

***<End of change3>***

***<Start of change4>***

Table 6.2.2.2.1.1-1: 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 | 8 | 9 | 14 | 15 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 2×2 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 010000 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-4 |

***<End of change4>***

***<Start of change5>***

Table 6.2.2.2.2.1-1: Wideband CQI reporting test under frequency non-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **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 | 6 | 7 | 12 | 13 |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | 2×2  |
| Correlation configuration |  | ULA high |
| 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-3 |

***<End of change5>***

***<Start of change6>***

Table 6.2.2.2.2.2-1: Sub-band CQI reporting test under frequency-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **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 | 8 | 9 | 14 | 15 |
| Propagation channel |  | Two tap model specified in Annex B.2.4 with *a*=1, *f*D = 5Hz, and τd=0.1125μs |
| Antenna configuration |  | 2×2 |
| Correlation configuration |  | As per 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 |  | Aperiodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | Not configured |
| timeRestrictionForInterferenceMeasurements |  | Not configured |
| cqi-FormatIndicator |  | Subband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 16 |
| 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, 10) = 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 |
| aperiodicTriggeringOffset |  | Not configured |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-6 |

***<End of change6>***

***<Start of change7>***

Table 6.2.3.1.1.1-1: CQI reporting definition test

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| SNR |  dB | 5 | 6 | 11 | 12 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 2×4 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 010000 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-2 |

***<End of change7>***

***<Start of change8>***

Table 6.2.3.1.2.1-1: Wideband CQI reporting test under frequency non-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| SNR |  dB |  3 |  4 |  9 |  10 |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | 2×4 |
| Correlation configuration |  | XP High |
| 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-1 |

***<End of change8>***

***<Srat of change9>***

Table 6.2.3.1.2.2-1: Sub-band CQI reporting test under frequency-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| SNR |  dB | 5 | 6 | 11 | 12 |
| Propagation channel |  | Two tap model specified in Annex B.2.4 with *a*=1, *f*D = 5Hz, and τd=0.45μs |
| Antenna configuration |  | 2×4  |
| Correlation configuration |  | As per 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 |  | Aperiodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | Not configured |
| timeRestrictionForInterferenceMeasurements |  | Not configured |
| cqi-FormatIndicator |  | Subband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 8 |
| csi-ReportingBand |  | 1111111 |
| CSI-Report periodicity and offset | slot | Not configured |
| Aperiodic Report Slot Offset |  | 5 |
| 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 |
| aperiodicTriggeringOffset |  | Not configured |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-5 |

***<End of change9>***

***<Start of change10>***

Table 6.2.3.2.1.1-1: 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 | 5 | 6 | 11 | 12 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 2×4 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
|  |  |  |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 010000 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-4 |

***<End of change10>***

***<Start of change11>***

Table 6.2.3.2.2.1-1: Wideband CQI reporting test under frequency non-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **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 | 3 | 4 | 9 | 10 |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | 2×4  |
| Correlation configuration |  | XP High |
| 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-3 |

***<End of change11>***

***<Start of change12>***

Table 6.2.3.2.2.2-1: Sub-band CQI reporting test under frequency-selective fading conditions

|  |  |  |  |
| --- | --- | --- | --- |
| **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 | 5 | 6 | 11 | 12 |
| Propagation channel |  | Two tap model specified in Annex B.2.4 with *a*=1, *f*D = 5Hz, and τd=0.1125μs |
| Antenna configuration |  | 2×4 |
| Correlation configuration |  | As per 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) |  | 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*) |  | 2 |
| CDM Type |  | FD-CDM2 |
| Density (ρ) |  | 1 |
| 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 |
| 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 |  | Aperiodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | Not configured |
| timeRestrictionForInterferenceMeasurements |  | Not configured |
| cqi-FormatIndicator |  | Subband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 16 |
| 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, 10) = 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 |
| aperiodicTriggeringOffset |  | 0 |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured |
| CodebookSubsetRestriction |  | 000001 |
| RI Restriction |  | N/A |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 9.5 |
| Maximum number of HARQ transmission |  | 1 |
| Measurement channel |  | As specified in Table A.4-2, TBS.2-6 |

***< End of change12>***

***<Start of change13>***

## 6.3 Reporting of Precoding Matrix Indicator (PMI)

The minimum performance requirements of PMI reporting are defined based on the precoding gain, expressed as the relative increase in throughput when the transmitter is configured according to the UE reported PMI compared to the case when the transmitter is using random precoding, respectively. When the transmitter uses random precoding, for each PDSCH allocation a precoder is randomly generated with equal propability of each applicable i1 and i2 combination and applied to the PDSCH. A fixed transport format (FRC) is configured for all requirements.

The requirements for transmission mode 1 with higher layer parameter *codebookType* set to 'typeI-SinglePanel' are specified in terms of the ratio:

 

In the definition of *γ*, for 4TX and 8TX PMI requirements,  is 90 % of the maximum throughput obtained at  using the precoders configured according to the UE reports, and is the throughput measured at with random precoding.

### 6.3.1 1RX requirements

(Void)

### 6.3.2 2RX requirements

#### 6.3.2.1 FDD

##### 6.3.2.1.1 Single PMI with 4TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.2.1.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.2.1.1-2.

Table 6.3.2.1.1-1: Test parameters (single layer)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 4 x 2(N1,N2) = (2,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| 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) |  | (13) |
| CSI-RSperiodicity and offset |  | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| 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 | Not configured |
| Aperiodic Report Slot Offset |  | 4 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (2,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 11111111 |
| RI Restriction |  | 00000001 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 6 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.1-6.1 FDD |
| 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (1 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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-3), this reported PMI cannot be applied at the gNB downlink before slot#(n+3).Note 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.2.1.1-2: Minimum requirement

|  |  |
| --- | --- |
| Parameter | Test 1 |
| ** | 1.3 |

##### 6.3.2.1.2 Single PMI with 8TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.2.1.2-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.2.1.2-2.

T Table 6.3.2.1.2-1: Test parameters (dual-layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 8 x 2(N1,N2) = (4,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| Number of CSI-RS ports (*X*) |  | 8 |
| CDM Type |  | CDM4 (FD2, TD2) |
| Density (ρ) |  | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 8, (4,6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (5) |
| CSI-RSperiodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| 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 | Not configured |
| Aperiodic Report Slot Offset |  | 5 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (4,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 0x FFFF |
| RI Restriction |  | 00000010 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.1-6.2  |
| 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (1 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.2.1.2-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.5 |

#### 6.3.2.2 TDD

##### 6.3.2.2.1 Single PMI with 4TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.2.2.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.2.2.1-2.

Table 6.3.2.2.1-1: Test parameters (single layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 40 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD DL-UL configuration |  | FR1.30-1 as specified in Annex A |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 4 x 2(N1,N2) = (2,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 10/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| 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) |  | (13) |
| CSI-RSperiodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| 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 | Not configured |
| Aperiodic Report Slot Offset |  | 8 |
| CSI request |  | 1 in slots i, where mod(i, 10) = 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (2,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 11111111 |
| RI Restriction |  | 00000001 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 5.5 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.2-8.1 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (0.5 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.2.2.1-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.3 |

##### 6.3.2.2.2 Single PMI with 8TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.2.2.2-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.2.2.2-2.

Table 6.3.2.2.2-1: Test parameters (dual-layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 40 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD DL-UL configurations |  | FR1.30-1 as specified in Annex A |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 8 x 2(N1,N2) = (4,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 10/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| Number of CSI-RS ports (*X*) |  | 8 |
| CDM Type |  | CDM4 (FD2, TD2) |
| Density (ρ) |  | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 8, (4,6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (5) |
| CSI-RSperiodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForIChannelMeasurements |  | 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 | Not configured |
| Aperiodic Report Slot Offset |  | 8 |
| CSI request |  | 1 in slots i, where mod(i, 10) = 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (4,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 0x FFFF |
| RI Restriction |  | 00000010 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 6.5 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.2-8.2 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (0.5 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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-6), this reported PMI cannot be applied at the gNB downlink before slot#(n+6).Note 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.2.2.2-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.5 |

### 6.3.3 4RX requirements

#### 6.3.3.1 FDD

##### 6.3.3.1.1 Single PMI with 4TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.3.1.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.3.1.1-2.

Table 6.3.3.1.1-1: Test parameters (single layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 4 x 4(N1,N2) = (2,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| 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) |  | (13) |
| CSI-RSperiodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| 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 | Not configured |
| Aperiodic Report Slot Offset |  | 4 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (2,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 11111111 |
| RI Restriction |  | 00000001 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 6 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.1-6.1 FDD |
| 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (1 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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-3), this reported PMI cannot be applied at the gNB downlink before slot#(n+3).Note 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.3.1.1-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.3 |

##### 6.3.3.1.2 Single PMI with 8TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.3.1.2-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.3.1.2-2.

Table 6.3.3.1.2-1: Test parameters (dual-layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 10 |
| Subcarrier spacing | kHz | 15 |
| Duplex Mode |  | FDD |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 8 x 4(N1,N2) = (4,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| Number of CSI-RS ports (*X*) |  | 8 |
| CDM Type |  | CDM4 (FD2, TD2) |
| Density (ρ) |  | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 8, (4,6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (5) |
| CSI-RSperiodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| 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 | Not configured |
| Aperiodic Report Slot Offset |  | 5 |
| 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (4,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 0x FFFF |
| RI Restriction |  | 00000010 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 8 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.1-6.2 FDD |
| 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (1 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.3.1.2-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.5 |

#### 6.3.3.2 TDD

##### 6.3.3.2.1 Single PMI with 4TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.3.2.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.3.2.1-2.

Table 6.3.3.2.1-1: Test parameters (single layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 40 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD DL-UL configuration |  | FR1.30-1 as specified in Annex A |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 4 x 4(N1,N2) = (2,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 10/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| 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) |  | (13) |
| CSI-RSperiodicity and offset |  | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| 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 | Not configured |
| Aperiodic Report Slot Offset |  | 8 |
| CSI request |  | 1 in slots i, where mod(i, 10) = 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (2,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 11111111 |
| RI Restriction |  | 00000001 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 5.5 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.2-8.1 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (0.5 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.3.2.1-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.3 |

##### 6.3.3.2.2 Single PMI with 8TX TypeI-SinglePanel Codebook

For the parameters specified in Table 6.3.3.2.2-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified in Table 6.3.3.2.2-2.

Table 6.3.3.2.2-1: Test parameters (dual-layer)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 40 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD DL-UL configurations |  | FR1.30-1 as specified in Annex A |
| Propagation channel |  | TDLA30-5 |
| Antenna configuration |  | High XP 8 x 4(N1,N2) = (4,1) |
| 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) |  | (9) |
| CSI-RSperiodicity and offset | slot | 10/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic |
| Number of CSI-RS ports (*X*) |  | 8 |
| CDM Type |  | CDM4 (FD2, TD2) |
| Density (ρ) |  | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 8, (4,6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (5) |
| CSI-RSperiodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic |
| CSI-IM RE pattern |  | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 1 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannnelMeasurements |  | 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 | Not configured |
| Aperiodic Report Slot Offset |  | 8 |
| CSI request |  | 1 in slots i, where mod(i, 10) = 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 | Codebook Type |  | typeI-SinglePanel |
| Codebook Mode |  | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | (4,1) |
| (CodebookConfig-O1,CodebookConfig-O2) |  | (4,1) |
| CodebookSubsetRestriction |  | 0x FFFF |
| RI Restriction |  | 00000010 |
| Physical channel for CSI report |  | PUSCH |
| CQI/RI/PMI delay  | ms | 6.5 |
| Maximum number of HARQ transmission |  | 4 |
| Measurement channel |  | R.PDSCH.2-8.2 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: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (0.5 ms granularity) with equal probability of each applicable i1, i2 combination.Note 2: 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-6), this reported PMI cannot be applied at the gNB downlink before slot#(n+6).Note 3: Randomization of the principle beam direction shall be used as specified in Annex B.2.3.2.3. |

Table 6.3.3.2.2-2: Minimum requirement

|  |  |
| --- | --- |
| **Parameter** | **Test 1** |
| ** | 1.5 |

***<End of change13>***

***<Start of change14>***

Table 6.4.2.1-1: RI Test (FDD)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** | **Test 3** |
| Bandwidth | MHz | 10 | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 | 15 |
| Duplex Mode |  | FDD | FDD | FDD |
| SNR  |  dB | 0 | 20 | 20 |
| Propagation channel |  | TDLA30-5 | TDLA30-5 | TDLA30-5 |
| Antenna configuration |  | ULA Low 2x2 | ULA Low 2x2 | ULA High 2x2 |
| Beamforming Model |  | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 |
| ZP CSI-RS configuration | CSI-RS resource Type |  | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 4 | 4 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 5,(4) | Row 5,(4) | Row 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (9) | (9) | (9) |
| CSI-RSperiodicity and offset | slot | 5/1 | 5/1 | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 2 | 2 | 2 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 3 (6) | Row 3 (6) | Row 3 (6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (13) | (13) | (13) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | 5/1 | 5/1 | 5/1 |
| CSI-IM configuration | CSI-IM resource Type |  | Periodic | Periodic | Periodic |
| CSI-IM RE pattern |  | Pattern 0 | Pattern 0 | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) | (4,9) | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | 5/1 | 5/1 | 5/1 |
| ReportConfigType |  | Periodic | Periodic | Periodic |
| CQI-table |  | Table 2 | Table 2 | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | not configured | not configured | not configured |
| timeRestrictionForInterferenceMeasurements |  | not configured | not configured | not configured |
| cqi-FormatIndicator |  | Wideband | Wideband | Wideband |
| pmi-FormatIndicator |  | Wideband | Wideband | Wideband |
| Sub-band Size | RB | 8 | 8 | 8 |
| csi-ReportingBand |  | 1111111 | 1111111 | 1111111 |
| CSI-Report periodicity and offset | slot | 5/0 | 5/0 | 5/0 |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel |
| Codebook Mode |  | 1 | 1 | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | N/A | N/A | N/A |
| CodebookSubsetRestriction |  | 010000 for fixed rank 2,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 000011 for fixed rank 1,010011 for following rank |
| RI Restriction |  | N/A | N/A | N/A |
| Physical channel for CSI report |  | PUCCH | PUCCH | PUCCH |
| CQI/RI/PMI delay  | ms | 8 | 8 | 8 |
| Maximum number of HARQ transmission |  | 1 | 1 | 1 |
| RI Configuration |  | Fixed RI = 2 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 1 and follow RI |
| Note 1: Measurements channels are specified in Table A.4-2. TBS.2-1 is used for Rank 1 case. TBS.2-2 is used for Rank 2 case. |

***<End of change14>***

***<Start of change15>***

Table 6.4.2.2-1: RI Test (TDD)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** | **Test 3** |
| Bandwidth | MHz | 40 | 40 | 40 |
| Subcarrier spacing | kHz | 30 | 30 | 30 |
| Duplex Mode |  | TDD | TDD | TDD |
| TDD Slot Configuration |  | FR1.30-1 | FR1.30-1 | FR1.30-1 |
| SNR  | dB | 0 | 20 | 20 |
| Propagation channel |  | TDLA30-5 | TDLA30-5 | TDLA30-5 |
| Antenna configuration |  | ULA Low 2x2 | ULA Low 2x2 | ULA High 2x2 |
| Beamforming Model |  | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 |
| ZP CSI-RS configuration | CSI-RS resource Type |  | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 4 | 4 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 5,(4) | Row 5,(4) | Row 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (9) | (9) | (9) |
| CSI-RSperiodicity and offset | slot | 10/1 | 10/1 | 10/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 2 | 2 | 2 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 3 (6) | Row 3 (6) | Row 3 (6) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (13) | (13) | (13) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | 10/1 | 10/1 | 10/1 |
| CSI-IM configuration | CSI-IM resource Type |  | Periodic | Periodic | Periodic |
| CSI-IM RE pattern |  | Pattern 0 | Pattern 0 | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) | (4,9) | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | 10/1 | 10/1 | 10/1 |
| ReportConfigType |  | Periodic | Periodic | Periodic |
| CQI-table |  | Table 2 | Table 2 | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | not configured | not configured | not configured |
| timeRestrictionForInterferenceMeasurements |  | not configured | not configured | not configured |
| cqi-FormatIndicator |  | Wideband | Wideband | Wideband |
| pmi-FormatIndicator |  | Wideband | Wideband | Wideband |
| Sub-band Size | RB | 16 | 16 | 16 |
| csi-ReportingBand |  | 1111111 | 1111111 | 1111111 |
| CSI-Report periodicity and offset | slot | 10/9 | 10/9 | 10/9 |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel |
| Codebook Mode |  | 1 | 1 | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | N/A | N/A | N/A |
| CodebookSubsetRestriction |  | 010000 for fixed rank 2,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 000011 for fixed rank 1,010011 for following rank |
| RI Restriction |  | N/A | N/A | N/A |
| Physical channel for CSI report |  | PUCCH | PUCCH | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 | 9.5 | 9.5 |
| Maximum number of HARQ transmission |  | 1 | 1 | 1 |
| RI Configuration |  | Fixed RI = 2 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 1 and follow RI |
| Note 1: Measurements channels are specified in Table A.4-2. TBS.2-3 is used for Rank 1 case. TBS.2-4 is used for Rank 2 case. |

***<End of change15>***

***<Start of change16>***

Table 6.4.3.1-1: RI Test (FDD)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** | **Test 3** | **Test 4** |
| Bandwidth | MHz | 10 | 10 | 10 | 10 |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |
| Duplex Mode |  | FDD | FDD | FDD | FDD |
| SNR  | dB | -2 | 16 | 16 | 22 |
| Propagation channel |  | TDLA30-5 | TDLA30-5 | TDLA30-5 | TDLA30-5 |
| Antenna configuration |  | ULA Low 2x4 | ULA Low 2x4 | ULA High 2x4 | ULA Low 4x4 |
| Beamforming Model |  | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 |
| ZP CSI-RS configuration | CSI-RS resource Type |  | Periodic | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 4 | 4 | 4 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 5,(4) | Row 5,(4) | Row 5,(4) | Row 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (9) | (9) | (9) | (9) |
| CSI-RSperiodicity and offset | slot | 5/1 | 5/1 | 5/1 | 5/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Periodic | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 2 | 2 | 2 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 3 (6) | Row 3 (6) | Row 3 (6) | Row 4 (0) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (13) | (13) | (13) | (13) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | 5/1 | 5/1 | 5/1 | 5/1 |
| CSI-IM configuration | CSI-IM resource Type |  | Periodic | Periodic | Periodic | Periodic |
| CSI-IM RE pattern |  | Pattern 0 | Pattern 0 | Pattern 0 | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) | (4,9) | (4,9) | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | 5/1 | 5/1 | 5/1 | 5/1 |
| ReportConfigType |  | Periodic | Periodic | Periodic | Periodic |
| CQI-table |  | Table 2 | Table 2 | Table 2 | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | not configured | not configured | not configured | not configured |
| timeRestrictionForInterferenceMeasurements |  | not configured | not configured | not configured | not configured |
| cqi-FormatIndicator |  | Wideband | Wideband | Wideband | Wideband |
| pmi-FormatIndicator |  | Wideband | Wideband | Wideband | Wideband |
| Sub-band Size | RB | 8 | 8 | 8 | 8 |
| csi-ReportingBand |  | 1111111 | 1111111 | 1111111 | 1111111 |
| CSI-Report periodicity and offset | slot | 5/0 | 5/0 | 5/0 | 5/0 |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel |
| Codebook Mode |  | 1 | 1 | 1 | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | N/A | N/A | N/A | (2,1) |
| CodebookSubsetRestriction |  | 010000 for fixed rank 2,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 11111111 |
| RI Restriction |  | N/A | N/A | N/A | 00000010 for fixed Rank 2 and 00001111 for follow RI |
| Physical channel for CSI report |  | PUCCH | PUCCH | PUCCH | PUCCH |
| CQI/RI/PMI delay  | ms | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmission |  | 1 | 1 | 1 | 1 |
| RI Configuration |  | Fixed RI = 2 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 2 and follow RI |
| Note 1: Measurements channels are specified in Table A.4-2 and Table A.4-3. TBS.2-1 is used for Rank 1 case. TBS.2-2 is used for Rank 2 case. TBS.3-1 is used for Rank 3 case. TBS.3-2 is used for Rank 4 case. |

***<End of change16>***

***<Start of change17>***

Table 6.4.3.2-1: RI Test (TDD)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** | **Test 3** | **Test 4** |
| Bandwidth | MHz | 40 | 40 | 40 | 40 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 |
| Duplex Mode |  | TDD | TDD | TDD | TDD |
| TDD Slot Configuration |  | FR1.30-1 | FR1.30-1 | FR1.30-1 | FR1.30-1 |
| SNR  | dB | -2 | 16 | 16 | 22 |
| Propagation channel |  | TDLA30-5 | TDLA30-5 | TDLA30-5 | TDLA30-5 |
| Antenna configuration |  | ULA Low 2x4 | ULA Low 2x4 | ULA High 2x4 | ULA Low 4x4 |
| Beamforming Model |  | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 |
| ZP CSI-RS configuration | CSI-RS resource Type |  | Periodic | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 4 | 4 | 4 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 5,(4) | Row 5,(4) | Row 5,(4) | Row 5,(4) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (9) | (9) | (9) | (9) |
| CSI-RSperiodicity and offset | slot | 10/1 | 10/1 | 10/1 | 10/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Periodic | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 2 | 2 | 2 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0) |  | Row 3 (6) | Row 3 (6) | Row 3 (6) | Row 4 (0) |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | (13) | (13) | (13) | (13) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | 10/1 | 10/1 | 10/1 | 10/1 |
| CSI-IM configuration | CSI-IM resource Type |  | Periodic | Periodic | Periodic | Periodic |
| CSI-IM RE pattern |  | Pattern 0 | Pattern 0 | Pattern 0 | Pattern 0 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (4,9) | (4,9) | (4,9) | (4,9) |
| CSI-IM timeConfigperiodicity and offset | slot | 10/1 | 10/1 | 10/1 | 10/1 |
| ReportConfigType |  | Periodic | Periodic | Periodic | Periodic |
| CQI-table |  | Table 2 | Table 2 | Table 2 | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | not configured | not configured | not configured | not configured |
| timeRestrictionForInterferenceMeasurements |  | not configured | not configured | not configured | not configured |
| cqi-FormatIndicator |  | Wideband | Wideband | Wideband | Wideband |
| pmi-FormatIndicator |  | Wideband | Wideband | Wideband | Wideband |
| Sub-band Size | RB | 16 | 16 | 16 | 16 |
| csi-ReportingBand |  | 1111111 | 1111111 | 1111111 | 1111111 |
| CSI-Report periodicity and offset | slot | 10/9 | 10/9 | 10/9 | 10/9 |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel |
| Codebook Mode |  | 1 | 1 | 1 | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | N/A | N/A | N/A | (2,1) |
| CodebookSubsetRestriction |  | 010000 for fixed rank 2,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 11111111 |
| RI Restriction |  | N/A | N/A | N/A | 00000010 for fixed Rank 2 and 00001111 for follow RI |
| Physical channel for CSI report |  | PUCCH | PUCCH | PUCCH | PUCCH |
| CQI/RI/PMI delay  | ms | 9.5 | 9.5 | 9.5 | 9.5 |
| Maximum number of HARQ transmission |  | 1 | 1 | 1 | 1 |
| RI Configuration |  | Fixed RI = 2 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 2 and follow RI |
| Note 1: Measurements channels are specified in Table A.4-2 and Table A.4-3. TBS.2-3 is used for Rank 1 case. TBS.2-4 is used for Rank 2 case. TBS.3-3 is used for Rank 3 case. TBS.3-4 is used for Rank 4 case. |

***<End of change17>***

***<Start of change18>***

#### 8.4.2.2 TDD

The minimum performance requirement in Table 8.4.2.2-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be ≥ g1;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be ≥ g2;

For the parameters specified in Table 8.4.2.2-1, and using the downlink physical channels specified in Annex C.5.1, the minimum requirements are specified in Table 8.4.2.2-2.

Table 8.4.2.2-1: RI Test (TDD)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** | **Test 3** |
| Bandwidth | MHz | 100 | 100 | 100 |
| Subcarrier spacing | kHz | 120 | 120 | 120 |
| Duplex Mode |  | TDD | TDD | TDD |
| TDD Slot Configuration |  | FR2.120-2 | FR2.120-2 | FR2.120-2 |
| SNR  |  dB | 0 | 16 | 16 |
| Propagation channel |  | TDLA30-35 | TDLA30-35 | TDLA30-35 |
| Antenna configuration |  | ULA Low 2x2 | ULA Low 2x2 | XP High 2x2 |
| Beamforming Model |  | As defined in Annex B.4.1 | As defined in Annex B.4.1 | As defined in Annex B.4.1 |
| ZP CSI-RS configuration | CSI-RS resource Type |  | Periodic | Periodic | Periodic |
| Number of CSI-RS ports (*X*) |  | 4 | 4 | 4 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 4, (8,-) | Row 4, (8,-) | Row 4, (8,-) |
| First OFDM symbol in the PRB used for CSI-RS (l0, l1) |  | (13,-) | (13,-) | (13,-) |
| CSI-RSperiodicity and offset | slot | 8/1 | 8/1 | 8/1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Aperiodic | Aperiodic | Aperiodic |
| Number of CSI-RS ports (*X*) |  | 2 | 2 | 2 |
| CDM Type |  | FD-CDM2 | FD-CDM2 | FD-CDM2 |
| Density (ρ) |  | 1 | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1 ) |  | Row 3 (6,-) | Row 3 (6,-) | Row 3 (6,-) |
| First OFDM symbol in the PRB used for CSI-RS (l0, l1) |  | (13,-) | (13,-) | (13,-) |
| NZP CSI-RS-timeConfigperiodicity and offset | slot | Not configured | Not configured | Not configured |
| aperiodicTriggeringOffset |  | 0 | 0 | 0 |
| CSI-IM configuration | CSI-IM resource Type |  | Aperiodic | Aperiodic | Aperiodic |
| CSI-IM RE pattern |  | Pattern 1 | Pattern 1 | Pattern 1 |
| CSI-IM Resource Mapping(kCSI-IM,lCSI-IM) |  | (8,13) | (8,13) | (8,13) |
| CSI-IM timeConfigperiodicity and offset | slot | Not configured | Not configured | Not configured |
| ReportConfigType |  | Aperiodic  | Aperiodic | Aperiodic |
| CQI-table |  | Table 1 | Table 1 | Table 1 |
| reportQuantity |  | cri-RI-PMI-CQI | cri-RI-PMI-CQI | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | not configured | not configured | not configured |
| timeRestrictionForInterferenceMeasurements |  | not configured | not configured | not configured |
| cqi-FormatIndicator |  | Wideband | Wideband | Wideband |
| pmi-FormatIndicator |  | Wideband | Wideband | Wideband |
| Sub-band Size | RB | 8 | 8 | 8 |
| csi-ReportingBand |  | 111111111 | 111111111 | 111111111 |
| CSI-Report periodicity and offset | slot | Not configured | Not configured | Not configured |
| Aperiodic Report Slot Offset |  | 6 | 6 | 6 |
| CSI request |  | 1 in slots i, where mod(i, 8) = 1, otherwise it is equal to 0 | 1 in slots i, where mod(i, 8) = 1, otherwise it is equal to 0 | 1 in slots i, where mod(i, 8) = 1, otherwise it is equal to 0 |
| reportTriggerSize |  | 1 | 1 | 1 |
| CSI-AperiodicTriggerStateList |  | One State with one Associated Report ConfigurationAssociated Report Configuration contains pointers to NZP CSI-RS and CSI-IM | One State with one Associated Report ConfigurationAssociated Report Configuration contains pointers to NZP CSI-RS and CSI-IM | One State with one Associated Report ConfigurationAssociated Report Configuration contains pointers to NZP CSI-RS and CSI-IM |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel | typeI-SinglePanel | typeI-SinglePanel |
| Codebook Mode |  | 1 | 1 | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | N/A | N/A | N/A |
| CodebookSubsetRestriction |  | 010000 for fixed rank 2,010011 for following rank | 000011 for fixed rank 1,010011 for following rank | 000011 for fixed rank 1,010011 for following rank |
| RI Restriction |  | N/A | N/A | N/A |
| Physical channel for CSI report |  | PUSCH | PUSCH | PUSCH |
| CQI/RI/PMI delay  | ms | 1.375 | 1.375 | 1.375 |
| Maximum number of HARQ transmission |  | 1 | 1 | 1 |
| RI Configuration |  | Fixed RI = 2 and follow RI | Fixed RI = 1 and follow RI | Fixed RI = 1 and follow RI |
| Note 1: Measurements channels are specified in Table A.4-1. TBS.1-1 is used for Rank 1 case. TBS.1-2 is used for Rank 2 case. |

Table 8.4.2.2-2: Minimum requirement (TDD)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Test 1** | **Test 2** | **Test 3** |
| *g*1 | N/A | 1.05 | 1.05 |
| *g*2 | 1.0 | N/A | N/A |

***<End of change18>***