**3GPP TSG-RAN WG4 Meeting #100-e *R4-2115855***

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

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-4** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MCC, Intel Corporation | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Perf,  NR\_unlic-Perf,  5G\_V2X\_NRSL-Perf,  ,  NR\_perf\_enh-Perf  NR\_L1enh\_URLLC-Perf | | | | |  | ***Date:*** | | | 2021-08-29 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This big CRs merge the mutile endorsed draf CRs. The reason for change in each endorsed draft CR is copied below.  **R4-2111894 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”  **R4-2111897 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.  **R4-2113625 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-16**  Several parameter configurations and PMI gamma formula is not correct  **R4-2115698 CR to TS38.101-4 on PDSCH requirements for standalone NR-U (Rel-16)**   1. The requiremnt values for both 2x2 and 2x4 cases are not captured correctly 2. Reference channel number should follow the last two digit of table number   **R4-2114182 Draft CR on PDSCH Reference measurement channel for NR-U**  Current table for PDSCH Reference Channels (Table A.3.2.2.2-18) is very difficult to understand  **R4-2115696 Draft CR to 38.101-4 on CQI reporting requirements in Scenario A for NR-U-R16**  Finalize requirements for CQI reporting for NR-U in Scenario A.  **R4-2115697 draftCR: Updates to NR-U CQI requirements for scenario C for Rel-16**   1. The periodicity of ZP-CSI-RS and CSI-IM are not equal to fixed frame periodicity.i.e.10ms 2. Table number of CQI reporting test parameters of 4RX is wrong   **R4-2115669 Draft CR for Abbreviations for Rel-16 NR V2X demodulation**  There are no Abbreviations for NR V2X demodulation performance.  **R4-2115670 Draft CR to 38.101-4 on Applicability for multi-TRxP test cases-R16**  For multi-TRxP test cases 2 active TCI states are configured. For multi-DCI test cases applicability based on UE capability *multiDCI-MultiTRP-r16* also includes *maxNumberCORESETPerPoolIndex-r16,* which is sufficient to indicate support of 2 active TCI states. For single DCI based inter-slot TDM scheme, there is additional capability indication for *maxNumberTCI-states-r16*. Hence, for single-DCI based inter-slot TDM scheme requirements we need to add additional applicability based on UE capability for supporting 2 active TCI states.  **R4-2112957 draft CR: FR1 EN-DC power imbalance requirements**  RAN4#98-e agreed that Note2 in Table 9.1.1-3 in TS38 101-4 was TBD.  Also, RAN4#98-e agreed on following sentences;  *“In addition, add the following note in the Chairman Notes:*  *Note 2 in Table 9.1.1-3 will be updated in the future based on further discussion on the interpretation of “interBandContiguousMRDC” in RF session.”*(R4-2103942, 4.6 Summary on 2nd round)  At the RAN4#99-e, the interpretation of *“interBandContiguousMRDC”* was clarified in RF session.(R4-2107755, R4-2109982, R4-2110031)  From this discussion, RAN4 revised the sentence of Note4 in Table 5.5B.4.1-1 in TS38 101-3 as follows.;  *“The minimum requirements for intra-band non-contiguous EN-DC apply. When UE capability interBandContiguousMRDC is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC. The intra-band requirements also apply for these carriers when applicable EN-DC configuration is a subset of a higher order EN-DC configuration.”*  From this situation, we would like to introduce this draft CR to modify "TBD" to “UE supports both intra-band contiguous and non-contiguous EN-DC requirements for supported inter-band EN-DC combinations”  **R4-2115671 Draft CR to 38.101-4: Correction of SNR levels for 0.001% BLER PDSCH requirement**  The SNR values for the 0.001% BLER requirement capture the agreed averaged results, as documented in R4-2103898. However the additional margin of 0.5dB to account for span, which is usual for UE demodulation requirements, has not been included  **R4-2113773 draftCR: Updates to PDSCH FRC in TS 38.101-4 for Rel-16**  The caclulation for number of CBs in Table A.3.2.2.2-16 are wrong  **R4-2115672 CR to TS38.101-4 on URLLC requirements (Rel-16)**   1. Some parts in agreed CR R4-2108547 are not implemented 2. R.PDSCH. 1-2.5 FDD is not for setcions 5.2.2.1.8 and 5.2.3.1.8 3. R.PDSCH. 2-2.5 TDD is not for setcions 5.2.2.2.8 and 5.2.3.2.8 4. R.PDSCH. 5-10.1 TDD is not for section 7.2.2.2.2 5. Redundant “space” in section 7.2.2.2.3 6. Reference channel number should follow the last two digit of table number | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The summary of change in each each endorsed draft CR is copied below.  **R4-2111894 CR to RI reporting parameter settings**  Corrected typo on CSI-IM resource Type: Periodic -> Aperiodic in Table 8.4.2.2-1  **R4-2111897 CR to reporting granularity for PMI TCs**  PDSCH & PDSCH DMRS precoding configuration for ramdom precoding are added to test parameters in PMI TCs.  **R4-2113625 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-16**  Correction of some of the parameter configuraions and formula  **R4-2115698 CR to TS38.101-4 on PDSCH requirements for standalone NR-U (Rel-16)**   1. The requiremnt values for both 2x2 and 2x4 cases are corrected according to R4-2109351 2. Modify the reference channel number in Table A.3.2.2.2-18 and the corresponding reference channel number in Table 5.2.2.2.15-3 and Table 5.2.3.2.15-3   **R4-2114182 Draft CR on PDSCH Reference measurement channel for NR-U**  Following changes are introduced: into TS 38.101-4:   * More clarification was added to Note 3 of Table A.3.2.2.2-18 * Clarifiying Note 5 was added to Table A.3.2.2.2-18. * The Number of DMRS REs in Table A.3.2.2.2-18 was corrected to comply with Note 3.   **R4-2115696 Draft CR to 38.101-4 on CQI reporting requirements in Scenario A for NR-U-R16**  Removed “[]”. Aligned simulation parameters with CQI reporting in Scenario C.  **R4-2115697 draftCR: Updates to NR-U CQI requirements for scenario C for Rel-16**   1. Change the periodicity of ZP-CSI-RS and CSI-IM from 5 to 10 2. Change Table number of CQI reporting test parameters of 4RX from “6.2.2.2.1.3-1” to “6.2.3.2.1.3-1”   **R4- 2115669 Draft CR for Abbreviations for Rel-16 NR V2X demodulation**  Add Abbreviations for NR V2X  **R4-2115670 Draft CR to 38.101-4 on Applicability for multi-TRxP test cases-R16**  Added applicability for single DCI based inter-slot TDM scheme requirements based on UE capability of *maxNumberTCI-states-r16*=2.  **R4-2112957 draft CR: FR1 EN-DC power imbalance requirements**  Update Note2 in Table 9.1.1-3 according to the related agreeements as following:  “*UE supports both intra-band contiguous and non-contiguous EN-DC requirements for supported inter-band EN-DC combinations*”  **R4-2115671 Draft CR to 38.101-4: Correction of SNR levels for 0.001% BLER PDSCH requirement**  SNR values increased by 0.5dB to account for the span margin.  **R4-2113773 draftCR: Updates to PDSCH FRC in TS 38.101-4 for Rel-16**  Change the number of CBs for FRC of R.PDSCH.1-16.1 TDD and R.PDSCH.1-16.2 TDD in Table A.3.2.2.2-16 from 2 to 4  **R4-2115672 CR to TS38.101-4 on URLLC requirements (Rel-16)**   1. Add R.PDSCH. 1-2.6 FDD in Table A.3.2.1.1-2 according to R4-2103901, also modifiy Tables 5.2.2.1.8-3 and 5.2.3.1.8-3 2. Add R.PDSCH. 2-2.6 TDD in Table A.3.2.2.2-2 according to R4-2103901, also modifiy Tables 5.2.2.2.8-3 and 5.2.3.2.8-3 3. Moddify R.PDSCH. 5-10.1 TDD to R.PDSCH. 5-11.1 TDD in Table A.3.2.2.5-11. Aslo modify the Table 7.2.2.2.2-3 4. Modifty the reference channel R.PDSCH.1-16.1 TDD, R.PDSCH.1-17.1 TDD to R.PDSCH.2-16.1 TDD, R.PDSCH.2-17.1 TDD respectively. Also modify Tables 5.2.2.2.6-3, 5.2.2.2.7-3, 5.2.3.2.6-3 and 5.2.3.2.7-3 5. Remove the redundant ‘space’ in section 7.2.2.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The consequences if not approved for each endorsed draft CR are coppied below.  **R4-2111894 CR to RI reporting parameter settings**  Conformance Test cannot be correctly performed.  **R4-2111897 CR to reporting granularity for PMI TCs**  Reporting granularity remains unclear.  **R4-2113625 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-16**  Several parameter configurations and the formula for PMI gamma is not correct  **R4-2115698 CR to TS38.101-4 on PDSCH requirements for standalone NR-U (Rel-16)**  The values for requirements are wrong  **R4-2114182 Draft CR on PDSCH Reference measurement channel for NR-U**  Test cases may not be implemented correctly  **R4-2115696 Draft CR to 38.101-4 on CQI reporting requirements in Scenario A for NR-U-R16**  CQI reporting requirements for NR-U in Scenario A will not be finalized.  **R4-2115697 draftCR: Updates to NR-U CQI requirements for scenario C for Rel-16**  The parameters are not correct.  **R4- 2115669 Draft CR for Abbreviations for Rel-16 NR V2X demodulation**  The NR V2X abbreviations are not defined.  **R4-2115670 Draft CR to 38.101-4 on Applicability for multi-TRxP test cases-R16**  Single DCI multi-TRxP test cases applicability rules will be incomplete.  **R4-2112957 draft CR: FR1 EN-DC power imbalance requirements**  Since Note2 is TBD, this power imbalance requirement cannot be clarified.  **R4-2115671 Draft CR to 38.101-4: Correction of SNR levels for 0.001% BLER PDSCH requirement**  SNR values for the 0.001% BLER requirement do not follow the usual procedure for UE demodulation  **R4-2113773 draftCR: Updates to PDSCH FRC in TS 38.101-4 for Rel-16**  The FRCs will still be incorrect in the specification.  **R4-2115672 CR to TS38.101-4 on URLLC requirements (Rel-16)**   1. Wrong reference channels for sections 5.2.2.1.8, 5.2.3.1.8, 5.2.2.2.8 and 5.2.3.2.8 2. Wrong code rate in Table 5.2.2.2.8-3 3. Wrong reference channel in Table A.3.2.2.5-11 and Table 7.2.2.2.2-3 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | The clausses affected in each endorsed draft CR are copied below.  **R4-2111894 CR to RI reporting parameter settings**  8.4.2.2  **R4-2111897 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  **R4-2113625 Draft CR on TS38.101-4: Correction of parameter configuraions in Rel-16**  6.2, 6.3, 6.4  **R4-2115698 CR to TS38.101-4 on PDSCH requirements for standalone NR-U (Rel-16)**  Section 5.2.2.1, 5.2.2.2, 5.2.2.2.15, 5.2.3.2.15 and A.3.2.2  **R4-2114182 Draft CR on PDSCH Reference measurement channel for NR-U**  A.3.2.2.4  **R4-2115696 Draft CR to 38.101-4 on CQI reporting requirements in Scenario A for NR-U-R16**  6.2A.3.1.2, 6.2A.4.1.1  **R4-2115697 draftCR: Updates to NR-U CQI requirements for scenario C for Rel-16**  6.2.2.2.1.3, 6.2.3.2.1.3  **R4- 2115669 Draft CR for Abbreviations for Rel-16 NR V2X demodulation**  3  **R4-2115670 Draft CR to 38.101-4 on Applicability for multi-TRxP test cases-R16**  5.1.1.3  **R4-2112957 draft CR: FR1 EN-DC power imbalance requirements**  9.1.1  **R4-2115671 Draft CR to 38.101-4: Correction of SNR levels for 0.001% BLER PDSCH requirement**  5.2.2.1.5, 5.2.2.2.5, 5.2.3.1.5, 5.2.3.2.5  **R4-2113773 draftCR: Updates to PDSCH FRC in TS 38.101-4 for Rel-16**  Table A.3.2.2.2-16  **R4-2115672 CR to TS38.101-4 on URLLC requirements (Rel-16)**  5.2.2.2.8, 5.2.3.2.8, A.3.2.2.2, 7.2.2.2.3, A.3.2.2.5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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>***

3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**DL BWP**: DL bandwidth part as defined in TS 38.213 [11].

**EN-DC**: E-UTRA-NR Dual Connectivity as defined in clause 4.1.2 of TS 37.340 [13].

**Enhanced Receiver Type 1:** SU-MIMO interference mitigation advanced receiver [14]

- R-ML (reduced complexity ML) receiver with enhanced inter-stream interference suppression for SU-MIMO transmissions with rank 2 with 2 RX antennas

- R-ML (reduced complexity ML) receiver with enhanced inter-stream interference suppression for SU-MIMO transmissions with rank 2, 3, and 4 with 4 RX antennas

**FR1**: Frequency range 1 as defined in clause 5.1 of TS 38.101-3 [8].

**FR2**: Frequency range 2 as defined in clause 5.1 of TS 38.101-3 [8].

**SSB:** SS/PBCH block as defined in clause 7.8.3 of TS 38.211 [9].

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

Es The averaged received energy per Hz of the wanted signal during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector; average power is computed within a set of REs used for the transmission of physical, divided transmission bandwidth within the set

 Subcarrier spacing configuration as defined in clause 4.2 of TS 38.211 [9]

 The power spectral density of a white noise source with average power per Hz as defined in Clause 4.4.3 for conducted requirements and Clause 4.5.3 for radiated requirements

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

CA Carrier Aggregation

CC Component Carrier

CCE Control Channel Element

CORESET Control Resource Set

CP Cyclic Prefix

CSI Channel-State Information

CSI-IM CSI Interference Measurement

CSI-RS CSI Reference Signal

CW Codeword

CQI Channel Quality Indicator

CRC Cyclic Redundancy Check

CRI CSI-RS Resource Indicator

DC Dual Connectivity

DCI Downlink Control Information

DL Downlink

DMRS Demodulation Reference Signal

DPS Dynamic Point Selection

EPRE Energy Per Resource Element

EN-DC E-UTRA-NR Dual Connectivity

FR Frequency Range

FRC Fixed Reference Channel

GNSS Global Navigation Satellite System

HARQ Hybrid Automatic Repeat Request

HST High Speed Train

HST-SFN High Speed Train Single Frequency Network

LI Layer Indicator

MAC Medium Access Control

MCS Modulation and Coding Scheme

MIB Master Information Block

NR New Radio

NSA Non-Standalone Operation Mode

OCNG OFDMA Channel Noise Generator

OFDM Orthogonal Frequency Division Multiplexing

OFDMA Orthogonal Frequency Division Multiple Access

PBCH Physical Broadcast Channel

Pcell Primary Cell

PDCCH Physical Downlink Control Channel

PDSCH Physical Downlink Shared Channel

PMI Precoding Matrix Indicator

PRB Physical Resource Block

PRG Physical resource block group

PSBCH Physical Sidelink Broadcast Channel

PSCCH Physical Sidelink Control Channel

PSFCH Physical Sidelink Feedback Channel

PSS Primary Synchronization Signal

PSSCH Physical Sidelink Shared Channel

PTRS Phase Tracking Reference Signal

PUCCH Physical Uplink Control Channel

PUSCH Physical Uplink Shared Channel

QCL Quasi Co-location

RB Resource Block

RBG Resource Block Group

RE Resource Element

REG Resource Element Group

RI Rank Indicator

RRC Radio Resource Control

SA Standalone operation mode

SCI Sidelink Control Information

SCS Subcarrier Spacing

SINR Signal-to-Interference-and-Noise Ratio

SL Sidelink

SLSS Sidelink Synchronization Signal

SNR Signal-to-Noise Ratio

SS Synchronization Signal

SSB Synchronization Signal Block

SSS Secondary Synchronization Signal

TCI Transmission Configuration Indicator

TDM Time division multiplexing

TRxP Transmission and Reception Point

TTI Transmission Time Interval

UL Uplink

V2X Vehicle to Everything

VRB Virtual Resource Block

***<End of change1>***

***<Start of change2>***

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

The performance requirements in Table 5.1.1.3-1 shall apply for UEs which support optional UE features only.

Table 5.1.1.3-1: Requirements applicability for optional UE features

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE feature/capability [14] | Test type | | Test list | Applicability notes |
| SU-MIMO Interference Mitigation advanced receiver | FR1 FDD | PDSCH | Clause 5.2.2.1.1 (Test 3-1)  Clause 5.2.3.1.1 (Test 5-1) |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.1 (Test 3-1)  Clause 5.2.3.2.1 (Test 5-1) |  |
| Alternative additional DMRS position for co-existence with LTE CRS *(additionalDMRS-DL-Alt)* | FR1 FDD | PDSCH | Clause 5.2.2.1.4 (Test 1-2)  Clause 5.2.3.1.4 (Test 1-2) |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.4 (Test 1-2)  Clause 5.2.3.2.4 (Test 1-2) |  |
| Basic DL NR-NR CA operation (*supportedBandCombinationList*) | NR CA | SDR | Clause 5.5A.1 | 1)Up to 16 DL carriers  2)Same numerology across carrier for data/control channel at a given time |
| Enhanced demodulation processing for HST-SFN joint transmission scheme with velocity up to 500km/h | FR1 FDD | PDSCH | Clause 5.2.2.1.9 (Test 1-1)  Clause 5.2.3.1.9 (Test 1-1) |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.9 (Test 1-1)  Clause 5.2.3.2.9 (Test 1-1) |  |
| Alternative 64QAM MCS table for PDSCHNew 64QAM MCS table for PDSCH (*dl-64QAM-MCS-TableAlt*) | FR1 FDD | PDSCH | Clause 5.2.2.1.5  Clause 5.2.3.1.5  Clause 5.2.2.1.6  Clause 5.2.3.1.6 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.5  Clause 5.2.3.2.5  Clause 5.2.2.2.6  Clause 5.2.3.2.6 |  |
| CQI table with target BLER of 10^-5New CQI table (cqi-TableAlt) | FR1 FDD | PDSCH | Clause 5.2.2.1.5  Clause 5.2.3.1.5 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.5  Clause 5.2.3.2.5 |  |
| PDSCH repetitions over multiple slots *(pdsch-RepetitionMultiSlots)* | FR1 FDD | PDSCH | Clause 5.2.2.1.6  Clause 5.2.3.1.6 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.6  Clause 5.2.3.2.6 |  |
| UE PDSCH processing capability #2 *(pdsch-ProcessingType2)* | FR1 FDD | PDSCH | Clause 5.2.2.1.7  Clause 5.2.3.1.7 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.7  Clause 5.2.3.2.7 |  |
| Pre-emption indication for DL *(pre-EmptIndication-DL)* | FR1 FDD | PDSCH | Clause 5.2.2.1.8  Clause 5.2.3.1.8 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.8  Clause 5.2.3.2.8 |  |
| Single DCI based SDM transmission for multi-TRxP (singleDCI-SDM-scheme-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.11  Clause 5.2.3.1.11 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.11  Clause 5.2.3.2.11 |  |
| Multi DCI based multi-TRxP support (multiDCI-MultiTRP-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.12  Clause 5.2.3.1.12 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.12  Clause 5.2.3.2.12 |  |
| Single DCI based FDM Scheme-A for multi-TRxP(supportFDM-SchemeA-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.13  Clause 5.2.3.1.13 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.13  Clause 5.2.3.2.13 |  |
| Single DCI based inter-slot TDM for multi-TRxP (supportInter-slotTDM-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.14  Clause 5.2.3.1.14 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.14  Clause 5.2.3.2.14 |  |
| Maximum number of TCI states in Single-DCI based inter-slot TDM (maxNumberTCI-states-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.14  Clause 5.2.3.1.14 | The requirements apply only when maxNumberTCI-states-r16 = 2. |
| FR1 TDD | PDSCH | Clause 5.2.2.2.14  Clause 5.2.3.2.14 |
| DRX Adaptation (*drx-Adaptation-r16*) | FR1 FDD | PDCCH | Clause 5.3.2.1.3 | If the Test 1 in Clause 5.3.2.1.3 is passed, the test coverage can be considered fulfilled without executing Test 3 in clause 5.3.2.1.1. |
| FR1 TDD | PDCCH | Clause 5.3.2.2.3 | If the Test 1 in Clause 5.3.2.2.3 is passed, the test coverage can be considered fulfilled without executing Test 2 in clause 5.3.2.2.1. |
| FR1 FDD | PDCCH | Clause 5.3.3.1.3 | If the Test 1 in Clause 5.3.3.1.3 is passed, the test coverage can be considered fulfilled without executing Test 3 in clause 5.3.3.1.1. |
| FR1 TDD | PDCCH | Clause 5.3.3.2.3 | If the Test 1 in Clause 5.3.3.2.3 is passed, the test coverage can be considered fulfilled without executing Test 2 in clause 5.3.3.2.1. |
| Validating P/SP-CSI-RS reception (*periodicAndSemi-PersistentCSI-RS-r16*) | FR1 TDD | PDSCH | Clause 5.2.2.2.15  Clause 5.2.3.2.15  Clause 5.2A.2.3  Clause 5.2A.3.3 | The requirements apply only in case tested UE supporting operations in shared spectrum access and validation of P/SP-CSI-RS reception based on DCI |
| Supported UL channels for dynamic channel access mode (*ul-DynamicChAccess-r16*) or UL channel access for semi-static channel access mode (ul-Semi-StaticChAccess-r16) or both | FR1 TDD | PDSCH | Clause 5.2.2.2.15  Clause 5.2.3.2.15 | The requirements apply only in case tested UE supports one of UL channels for dynamic channel access mode and UL channel access for semi-static channel access mode |

***<End of change2>***

***<Start of change3>***

5.2.2.1.5 Minimum requirements for PDSCH 0.001% BLER

The performance requirements are specified in Table 5.2.2.1.5-3, with the addition of test parameters in Table 5.2.2.1.5-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.1.5-1.

**Table 5.2.2.1.5-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH 0.001% BLER performance under 2 receive antenna conditions | 1-1 |

**Table 5.2.2.1.5-2: Test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| Duplex mode | |  | FDD |
| Active DL BWP index | |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S) |  | 2 |
|  | Length (L) |  | 12 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2 |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Maximum number of HARQ transmission | |  | 1 |
| Number of HARQ Processes | |  | 4 |
| The number of slots between PDSCH and corresponding HARQ-ACK information | |  | 2 |

**Table 5.2.2.1.5-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH.1-1.4 FDD | 10 / 15 | QPSK, 0.59 | AWGN | 1x2, ULA Low | 0.001% | 3.2 |

***<End of change3>***

***<Start of change4>***

5.2.2.1.8 Minimum requirements for PDSCH pre-emption

<SKIP UNCHANGED PART>

Table 5.2.2.1.8-3: Minimum performance for Rank 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value | |
| Fraction of maximum throughput (%) | SNR (dB) |
| 1-1 | R.PDSCH. 1-2.6 FDD | 10 / 15 | 16QAM  0.64 | TDLA30-10 | 2x2, ULA Low | 70 | 10.5 |

***<End of change4>***

***<Start of change5>***

5.2.2.2.5 Minimum requirements for PDSCH 0.001% BLER

The performance requirements are specified in Table 5.2.2.2.5-3, with the addition of test parameters in Table 5.2.2.2.5-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.2.5-1.

**Table 5.2.2.2.5-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH 0.001% BLER performance under 2 receive antenna conditions | 1-1 |

**Table 5.2.2.2.5-2: Test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| Duplex mode | |  | TDD |
| Active DL BWP index | |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S) |  | 2 |
|  | Length (L) |  | 12 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2 |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Maximum number of HARQ transmission | |  | 1 |
| Number of HARQ Processes | |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information | |  | Defined in Annex A.1.2 for TDD pattern FR1.30-1 |

**Table 5.2.2.2.5-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-1.4 TDD | 40 / 30 | QPSK, 0.59 | FR1.30-1 | AWGN | 1x2, ULA Low | 0.001% | 3.3 |

***<End of change5>***

***<Start of change6>***

5.2.2.2.6 Minimum requirements for PDSCH repetitions over multiple slots

<SKIP UNCHANGED PART>

**Table 5.2.2.2.6-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-16.1 TDD | 40 / 30 | 16QAM, 0.54 | FR1.30-1 | TDLA30-10 | 2x2, ULA Low | 1%(Note 1) | 1.4 |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | | |

***<End of change6>***

***<Start of change7>***

5.2.2.2.7 Minimum requirements for PDSCH Mapping Type B and UE processing capability 2

<SKIP UNCHANGED PART>

**Table 5.2.2.2.7-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation**  **condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-17.1 TDD | 40 / 30 | QPSK, 0.30 | FR1.30-2 | TDLA30-10 | 2x2, ULA Low | 70 | 0.6 |

***<End of change7>***

***<Start of change8>***

5.2.2.2.8 Minimum requirements for PDSCH pre-emption

<SKIP UNCHANGED PART>

Table 5.2.2.2.8-3: Minimum performance for Rank 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition | Correlation matrix and antenna configuration | Reference value | |
| Fraction of maximum throughput (%) | SNR (dB) |
| 1-1 | R.PDSCH. 2-2.6 TDD | 40 / 30 | 16QAM  0.64 | FR1.30-1 | TDLA30-10 | 2x2, ULA Low | 70 | 12.5 |

***<End of change8>***

***<Start of change9>***

5.2.2.2.15 Minimum requirements for PDSCH of PCell on band with shared spectrum access

<SKIP UNCHANGED PART>

**Table 5.2.2.2.15-3: Minimum performance for Rank 2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-18.1 TDD | 20 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x2, ULA Low | 70 | 13.8 |
| 1-2 | R.PDSCH.2-18.2 TDD | 40 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x2, ULA Low | 70 | 14.1 |
| 1-3 | R.PDSCH.2-18.3 TDD | 60 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x2, ULA Low | 70 | 14.2 |
| 1-4 | R.PDSCH.2-18.4 TDD | 80 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x2, ULA Low | 70 | 14.5 |

***<End of change9>***

***<Start of change10>***

5.2.3.1.5 Minimum requirements for PDSCH 0.001% BLER

The performance requirements are specified in Table 5.2.3.1.5-3, with the addition of test parameters in Table 5.2.3.1.5-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.1.5-1.

**Table 5.2.3.1.5-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH 0.001% BLER performance under 4 receive antenna conditions | 1-1 |

**Table 5.2.3.1.5-2: Test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| Duplex mode | |  | FDD |
| Active DL BWP index | |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S) |  | 2 |
| Length (L) |  | 12 |
| PDSCH aggregation factor |  | 1 |
| PRB bundling type |  | Static |
| PRB bundling size |  | 2 |
| Resource allocation type |  | Type 0 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Maximum number of HARQ transmission | |  | 1 |
| Number of HARQ Processes | |  | 4 |
| The number of slots between PDSCH and corresponding HARQ-ACK information | |  | 2 |

**Table 5.2.3.1.5-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH.1-1.4 FDD | 10 / 15 | QPSK, 0.59 | AWGN | 1x4, ULA Low | 0.001% | 0.7 |

***<End of change10>***

***<Start of change11>***

5.2.3.1.8 Minimum requirements for PDSCH pre-emption

<SKIP UNCHANGED PART>

Table 5.2.3.1.8-3: Minimum performance for Rank 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value | |
| Fraction of maximum throughput (%) | SNR (dB) |
| 1-1 | R.PDSCH. 1-2.6 FDD | 10 / 15 | 16QAM  0.64 | TDLA30-10 | 2x4, ULA Low | 70 | 6.6 |

***<End of change11>***

***<Start of change12>***

5.2.3.2.5 Minimum requirements for PDSCH 0.001% BLER

The performance requirements are specified in Table 5.2.3.2.5-3, with the addition of test parameters in Table 5.2.3.2.5-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.2.5-1.

**Table 5.2.3.2.5-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH 0.001% BLER performance under 4 receive antenna conditions | 1-1 |

**Table 5.2.3.2.5-2: Test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| Duplex mode | |  | TDD |
| Active DL BWP index | |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S) |  | 2 |
| Length (L) |  | 12 |
| PDSCH aggregation factor |  | 1 |
| PRB bundling type |  | Static |
| PRB bundling size |  | 2 |
| Resource allocation type |  | Type 0 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Maximum number of HARQ transmission | |  | 1 |
| Number of HARQ Processes | |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information | |  | Defined in Annex A.1.2 for TDD pattern FR1.30-1 |

**Table 5.2.3.2.5-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-1.4 TDD | 40 / 30 | QPSK, 0.59 | FR1.30-1 | AWGN | 1x4, ULA Low | 0.001% | 0.7 |

***<End of change12>***

***<Start of change13>***

5.2.3.2.6 Minimum requirements for PDSCH repetitions over multiple slots

<SKIP UNCHANGED PART>

**Table 5.2.3.2.6-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-16.1 TDD | 40 / 30 | 16QAM, 0.54 | FR1.30-1 | TDLA30-10 | 2x4, ULA Low | 1%(Note 1) | -2.6 |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | | |

***<End of change13>***

***<Start of change14>***

5.2.3.2.7 Minimum requirements for PDSCH Mapping Type B and UE processing capability 2

<SKIP UNCHANGED PART>

**Table 5.2.3.2.7-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation**  **condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-17.1 TDD | 40 / 30 | QPSK, 0.30 | FR1.30-2 | TDLA30-10 | 2x4, ULA Low | 70 | -2.5 |

***<End of change14>***

***<Start of change15>***

5.2.3.2.8 Minimum requirements for PDSCH pre-emption

<SKIP UNCHANGED PART>

Table 5.2.3.2.8-3: Minimum performance for Rank 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition | Correlation matrix and antenna configuration | Reference value | |
| Fraction of maximum throughput (%) | SNR (dB) |
| 1-1 | R.PDSCH. 2-2.6 TDD | 40 / 30 | 16QAM  0.64 | FR1.30-1 | TDLA30-10 | 2x4, ULA Low | 70 | 8.7 |

***<End of change15>***

***<Start of change16>***

5.2.3.2.15 Minimum requirements for PDSCH of PCell on band with shared spectrum access

<SKIP UNCHANGED PART>

**Table 5.2.3.2.15-3: Minimum performance for Rank 2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH.2-18.1 TDD | 20 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x4, ULA Low | 70 | 8.7 |
| 1-2 | R.PDSCH.2-18.2 TDD | 40 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x4, ULA Low | 70 | 8.7 |
| 1-3 | R.PDSCH.2-18.3 TDD | 60 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x4, ULA Low | 70 | 8.9 |
| 1-4 | R.PDSCH.2-18.4 TDD | 80 / 30 | 16QAM, 0.48 | FR1.30-7 | TDLA30-10 | 2x4, ULA Low | 70 | 9.1 |

***<End of change16>***

***<Start of change17>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change17>***

***<Start of change18>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change18>***

***<Start of change19>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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 change19>***

***<Start of change20>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change20>***

***<Start of change21>***

6.2.2.2.1.3 Minimum requirement for CQI reporting for PCell on band with shared spectrum access

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] for PCell on band with shared spectrum access. For each Downlink Transmission Duration the transmission power offset is randomly chosen between [0, +6] dB and 2 sets of CQI reports are obtained for each transmission power offset. 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 for each power offset. 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 6.2.2.2.1.3-1, and using the downlink physical channels specified in Annex A.4, the minimum requirements are specified by the following:

a) For each transmission power offset 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) For each transmission power offset, 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. For each transmission power offset, 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.

c) The absolute difference in median CQI for each of transmission power offset shall be ≥ 2.

**Table 6.2.2.2.1.3-1: CQI reporting test parameters for PCell on band with shared spectrum access**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | |
| Bandwidth | | | MHz | 20 | |
| Subcarrier spacing | | | kHz | 30 | |
| Duplex Mode | | |  | TDD | |
| Downlink Transmission Model | | |  | As specified in Annex B.5 | |
| Downlink Transmission Model Parameters | Downlink period | | ms | 5 | |
| LBT failure probability (*pLBT*) | |  | 0.25 | |
| Downlink transmission duration values set | | slot | {4,6,7} | |
| Occupied OFDM symbols in slot other than the last slot of the downlink duration | | symbol | 14 | |
| Occupied OFDM symbols in the last slot set of the downlink duration | | symbol | 14 | |
| TDD UL-DL pattern | | |  | FR1.30-7 | |
| SNR | | | dB | 8 | 9 |
| for power offset 1 | | | dBm/Hz | -112 | |
| for power offset 2 | | | dBm/Hz | -106 | |
| 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 |  | 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 5,4 | |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | 9 | |
| CSI-RS  interval and offset | slot | Not configured | |
| ZP CSI-RS trigger |  | 1 in slots i, where mod(i, 10) = 1, otherwise it is equal to 0 | |
| NZP CSI-RS for CSI acquisition | | CSI-RS resource Type |  | Aperiodic | |
| 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) |  | 3 | |
| CSI-RS  interval and offset | slot | Not configured | |
| aperiodicTriggeringOffset | slot | 0 | |
| CSI-IM configuration | | CSI-IM resource Type |  | Aperiodic | |
| CSI-IM RE pattern |  | 0 | |
| CSI-IM Resource Mapping  (kCSI-IM,lCSI-IM) |  | (4, 9) | |
| CSI-IM timeConfig  interval and offset | slot | Not configured | |
| ReportConfigType | | |  | Aperiodic | |
| CQI-table | | |  | Table 2 | |
| reportQuantity | | |  | cri-RI-PMI-CQI | |
| timeRestrictionForChannelMeasurements | | |  | configured | |
| timeRestrictionForInterferenceMeasurements | | |  | configured | |
| cqi-FormatIndicator | | |  | Wideband | |
| pmi-FormatIndicator | | |  | Wideband | |
| Sub-band Size | | | RB | 8 | |
| csi-ReportingBand | | |  | 1111111 | |
| CSI-Report interval and offset | | | slot | Not configured | |
| Aperiodic Report Slot Offset | | |  | 7 | |
| CSI request | | |  | 1 in slots i, where mod(i, 10) = 1, otherwise it is equal to 0 | |
| reportTriggrtSize | | |  | 1 | |
| CSI-AperiodicTriggerStateList | | |  | One State with one Associated Report Configuration  Associated Report Configuration contains pointers to NZP CSI-RS and CSI-IM | |
| 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 | | |  | PUSCH | |
| CQI/RI/PMI delay | | | ms | 9.5 | |
| Maximum number of HARQ transmission | | |  | 1 | |
| Measurement channel | | |  | As specified in Table A.4-2, TBS.2-8 | |

***<End of change21>***

***<Start of change22>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change22>***

***<Start of change23>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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 change23>***

***<Start of change24>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change24>***

***<Start of change25>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change25>***

***<Srat of change26>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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 change26>***

***<Start of change27>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change27>***

***<Start of change28>***

6.2.3.2.1.3 Minimum requirement for CQI reporting for PCell on band with shared spectrum access

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] for PCell on band with shared spectrum access. For each Downlink Transmission Duration the transmission power offset is randomly chosen between [0, +6] dB and 2 sets of CQI reports are obtained for each transmission power offset. 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 for each power offset. 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 6.2.3.2.1.3-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified by the following:

a) For each transmission power offset 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) For each transmission power offset, 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. For each transmission power offset, 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.

c) The absolute difference in median CQI for each of transmission power offset shall be ≥ 2.

**Table 6.2.3.2.1.3-1:** **CQI reporting test parameters for PCell on band with shared spectrum access**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | |
| Bandwidth | | | MHz | 20 | |
| Subcarrier spacing | | | kHz | 30 | |
| Duplex Mode | | |  | TDD | |
| Downlink Transmission Model | | |  | As specified in Annex B.5 | |
| Downlink Transmission Model Parameters | Downlink period | |  | 5 | |
| LBT failure probability (*pLBT*) | |  | 0.25 | |
| Downlink transmission duration values set | |  | {4,6,7} | |
| Occupied OFDM symbols in slot other than the last slot of the downlink duration | |  | 14 | |
| Occupied OFDM symbols in the last slot set of the downlink duration | |  | 14 | |
| TDD UL-DL pattern | | |  | FR1.30-7 | |
| SNR | | | dB | 5 | 6 |
| for power offset 1 | | | dBm/Hz | -112 | |
| for power offset 2 | | | dBm/Hz | -106 | |
| 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 |  | 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 5,4 | |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | 9 | |
| CSI-RS  interval and offset | slot | Not configured | |
| ZP CSI-RS trigger |  | 1 in slots i, where mod(i, 10) = 1, otherwise it is equal to 0 | |
| 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) |  | 3 | |
| CSI-RS  interval and offset | slot | Not configured | |
| aperiodicTriggeringOffset |  | 0 | |
| CSI-IM configuration | | CSI-IM resource Type |  | Aperiodic | |
| CSI-IM RE pattern |  | 0 | |
| CSI-IM Resource Mapping  (kCSI-IM,lCSI-IM) |  | (4, 9) | |
| CSI-IM timeConfig  interval and offset | slot | Not configured | |
| ReportConfigType | | |  | Aperiodic | |
| CQI-table | | |  | Table 2 | |
| reportQuantity | | |  | cri-RI-PMI-CQI | |
| timeRestrictionForChannelMeasurements | | |  | configured | |
| timeRestrictionForInterferenceMeasurements | | |  | configured | |
| cqi-FormatIndicator | | |  | Wideband | |
| pmi-FormatIndicator | | |  | Wideband | |
| Sub-band Size | | | RB | 8 | |
| csi-ReportingBand | | |  | 1111111 | |
| CSI-Report interval and offset | | | slot | Not configured | |
| Aperiodic Report Slot Offset | | |  | 7 | |
| CSI request | | |  | 1 in slots i, where mod(i, 10) = 1, otherwise it is equal to 0 | |
| reportTriggrtSize | | |  | 1 | |
| CSI-AperiodicTriggerStateList | | |  | One State with one Associated Report Configuration  Associated Report Configuration contains pointers to NZP CSI-RS and CSI-IM | |
| 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 | | |  | PUSCH | |
| CQI/RI/PMI delay | | | ms | 9.5 | |
| Maximum number of HARQ transmission | | |  | 1 | |
| Measurement channel | | |  | As specified in Table A.4-2, TBS.2-8 | |

***<End of change28>***

***<Start of change29>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change29>***

***<Start of change30>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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 change30>***

***<Start of change31>***

6.2A.3.1.2 Minimum requirement for CQI reporting for SCell on band with shared spectrum access

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] for Scell on band with shared spectrum access. For each downlink transmission duration the transmission power offset is randomly chosen between [0, +6] dB and 2 sets of CQI reports are obtained for each transmission power offset. 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 for each power offset. 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 6.2A.3.1.2-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified by the following:

a) For each transmission power offset 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) For each transmission power offset, 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. For each transmission power offset, 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.

c) The absolute difference in median CQI for each of transmission power offset shall be ≥ 2.

The test parameters for configuring the PCell are specified in Table 6.2A.3.1.2-2, but requirements are only applicable to SCell on band with shared spectrum access.

**Table 6.2A.3.1.2-1: CQI reporting test parameters for SCell on band with shared spectrum access**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | |
| Bandwidth | | | MHz | 20 | |
| Subcarrier spacing | | | kHz | 30 | |
| Duplex Mode | | |  | TDD | |
| Downlink Transmission Model | | |  | As specified in Annex B.5 | |
| Downlink Transmission Model Parameters | Downlink period | | ms | 5 | |
| LBT failure probability (*pLBT*) | |  | 0.25 | |
| Downlink transmission duration values set | | slot | {4,6,7} | |
| Occupied OFDM symbols in slot other than the last slot of the downlink duration | | symbols | 14 | |
| Occupied OFDM symbols in the last slot of the downlink duration | | symbols | 14 | |
| TDD UL-DL pattern | | |  | FR1.30-7 | |
| SNR | | | dB | 8 | 9 |
| for power offset 1 | | | dBm/Hz | -112 | |
| for power offset 2 | | | dBm/Hz | -106 | |
| 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-RS  periodicity and offset | slot | 10/1 | |
| NZP CSI-RS for CSI acquisition | | CSI-RS resource Type |  | Aperiodic | |
| 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, k1 ) |  | Row 3,(6,-) | |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | 3 | |
| NZP CSI-RS-timeConfig  periodicity and offset | slot | Not configured | |
| aperiodicTriggeringOffset |  | 0 | |
| CSI-IM configuration | | CSI-IM resource Type |  | Aperiodic | |
| CSI-IM RE pattern |  | 0 | |
| CSI-IM Resource Mapping  (kCSI-IM,lCSI-IM) |  | (4, 9) | |
| CSI-IM timeConfig  periodicity and offset | slot | Not configured | |
| Codebook configuration | | Codebook Type |  | typeI-SinglePanel | |
| Codebook Mode |  | 1 | |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured | |
| CodebookSubsetRestriction |  | 010000 | |
| RI Restriction |  | N/A | |
| CQI/RI/PMI delay | | | ms | 9.5 | |
| Maximum number of HARQ transmission | | |  | 1 | |
| Measurement channel | | |  | As specified in Table A.4-2, TBS.2-8 | |

**Table 6.2A.3.1.2-2: Configuration parameters for PCell**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 20 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD UL-DL pattern |  | FR1.30-1 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 2×2 with static channel specified in Annex B.1 |
| Beamforming Model |  | As specified in Annex B.4.1 |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | configured |
| timeRestrictionForInterferenceMeasurements |  | configured |
| cqi-FormatIndicator |  | Wideband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 8 |
| Csi-ReportingBand |  | 1111111 |
| CSI-Report periodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 7 |
| 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 Configuration  Associated Report Configuration contains pointers to NZP CSI-RS and CSI-IM |
| Physical channel for CSI report |  | PUSCH |

6.2A.4 4RX requirements

6.2A.4.1 CQI reporting definition under AWGN conditions

6.2A.4.1.1 Minimum requirement for CQI reporting for SCell on band with shared spectrum access

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] for Scell on band with shared spectrum access. For each downlink transmission duration the transmission power offset is randomly chosen between [0, +6] dB and 2 sets of CQI reports are obtained for each transmission power offset. 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 for each power offset. 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 6.2A.4.1.1-1, and using the downlink physical channels specified in Annex C.3.1, the minimum requirements are specified by the following:

a) For each transmission power offset 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) For each transmission power offset, 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. For each transmission power offset, 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.

c) The absolute difference in median CQI for each of transmission power offset shall be ≥ 2.

The test parameters for configuring the PCell are specified in Table 6.2A.4.1.1-2, but requirements are only applicable to SCell on band with shared spectrum access.

**Table 6.2A.4.1.1-1: CQI reporting test parameters for SCell on band with shared spectrum access**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | |
| Bandwidth | | | MHz | 20 | |
| Subcarrier spacing | | | kHz | 30 | |
| Duplex Mode | | |  | TDD | |
| Downlink Transmission Model | | |  | As specified in Annex B.5 | |
| Downlink Transmission Model Parameters | Downlink period | | ms | 5 | |
| LBT failure probability (*pLBT*) | |  | 0.25 | |
| Downlink transmission duration values set | | slot | {4,6,7} | |
| Occupied OFDM symbols in slot other than the last slot of the downlink duration | | symbols | 14 | |
| Occupied OFDM symbols in the last slot of the downlink duration | | symbols | 14 | |
| TDD UL-DL pattern | | |  | FR1.30-7 | |
| SNR | | | dB | 5 | 6 |
| for power offset 1 | | | dBm/Hz | -112 | |
| for power offset 2 | | | dBm/Hz | -106 | |
| 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-RS  periodicity and offset | slot | 10/1 | |
| NZP CSI-RS for CSI acquisition | | CSI-RS resource Type |  | Aperiodic | |
| 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, k1 ) |  | Row 3,(6,-) | |
| First OFDM symbol in the PRB used for CSI-RS (l0) |  | 3 | |
| NZP CSI-RS-timeConfig  periodicity and offset | slot | Not configured | |
| aperiodicTriggeringOffset |  | 0 | |
| CSI-IM configuration | | CSI-IM resource Type |  | Aperiodic | |
| CSI-IM RE pattern |  | 0 | |
| CSI-IM Resource Mapping  (kCSI-IM,lCSI-IM) |  | (4, 9) | |
| CSI-IM timeConfig  periodicity and offset | slot | Not configured | |
| Codebook configuration | | Codebook Type |  | typeI-SinglePanel | |
| Codebook Mode |  | 1 | |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Not configured | |
| CodebookSubsetRestriction |  | 010000 | |
| RI Restriction |  | N/A | |
| CQI/RI/PMI delay | | | ms | 9.5 | |
| Maximum number of HARQ transmission | | |  | 1 | |
| Measurement channel | | |  | As specified in Table A.4-2, TBS.2-8 | |

**Table 6.2A.4.1.1-2: Configuration parameters for PCell**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| Bandwidth | MHz | 20 |
| Subcarrier spacing | kHz | 30 |
| Duplex Mode |  | TDD |
| TDD UL-DL pattern |  | FR1.30-1 |
| Propagation channel |  | AWGN |
| Antenna configuration |  | 2×4 with static channel specified in Annex B.1 |
| Beamforming Model |  | As specified in Annex B.4.1 |
| ReportConfigType |  | Aperiodic |
| CQI-table |  | Table 2 |
| reportQuantity |  | cri-RI-PMI-CQI |
| timeRestrictionForChannelMeasurements |  | configured |
| timeRestrictionForInterferenceMeasurements |  | configured |
| cqi-FormatIndicator |  | Wideband |
| pmi-FormatIndicator |  | Wideband |
| Sub-band Size | RB | 8 |
| Csi-ReportingBand |  | 1111111 |
| CSI-Report periodicity and offset | slot | Not configured |
| aperiodicTriggeringOffset |  | 7 |
| 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 Configuration  Associated Report Configuration contains pointers to NZP CSI-RS and CSI-IM |
| Physical channel for CSI report |  | PUSCH |

***< End of change31>***

***<Start of change32>***

## 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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-RS  periodicity 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-RS  periodicity 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 timeConfig  periodicity 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 Configuration  Associated 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 change32>***

***<Start of change33>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change33>***

***<Start of change34>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change34>***

***<Start of change35>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change35>***

***<Start of change36>***

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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 change36>***

***<Start of change37>***

**Table 7.2.2.2.2-3: Minimum performance for Rank 1 (FRC)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Target BLER** | **SNR (dB)** |
| 1-1 | R.PDSCH. 5-11.1 TDD | 100 / 120 | 16QAM,  0.37 | FR2.120-2 | TDLA30-75 | 2x2 ULA Low | 1% (Note 1) | -1.1 |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | | |

7.2.2.2.3 Minimum requirements for PDSCH Mapping Type B

The performance requirements are specified in Table 7.2.2.2.3-3, with the addition of test parameters in Table 7.2.2.2. 3-2 and the downlink physical channel setup according to Annex C.5.1. The purpose is to verify the performance of PDSCH Type B scheduling.

The test purposes are specified in Table 7.2.2.2.3-1.

**Table 7.2.2.2.3-1: Test purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH mapping Type B performance under 2 receive antenna conditions | 1-1 |

**Table 7.2.2.2.3-2: Test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| Duplex mode | |  | TDD |
| Active DL BWP index | |  | 1 |
| PDCCH configuration | Number of PDCCH candidates and aggregation levels |  | 1/AL8 |
| PDSCH configuration | Mapping type |  | Type B |
| k0 |  | 0 |
| Starting symbol (S) |  | 1 |
| Length (L) |  | 2 |
| PDSCH aggregation factor |  | 1 |
| PRB bundling type |  | Static |
| PRB bundling size |  | 2 |
| Resource allocation type |  | Type 0 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 0 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Number of HARQ Processes | |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information | |  | Specific to each TDD UL-DL pattern and as defined in Annex A.1.3 |

**Table 7.2.2.2.3-3: Minimum performance for Rank 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation**  **condition** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH. 5-1.2 TDD | 100 / 120 | QPSK, 0.30 | FR2.120-1 | [TDLA30-75] | 2x2, ULA Low | 70 | 1.3 |

***<End of change37>***

***<Start of change38>***

#### 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-RS  periodicity 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-timeConfig  periodicity 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 timeConfig  periodicity 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 Configuration  Associated Report Configuration contains pointers to NZP CSI-RS and CSI-IM | One State with one Associated Report Configuration  Associated Report Configuration contains pointers to NZP CSI-RS and CSI-IM | One State with one Associated Report Configuration  Associated 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 change38>***

***<Start of change39>***

# 9 Demodulation performance requirements for interworking

## 9.1 General

This clause covers the UE demodulation performance requirements for EN-DC, NE-DC, inter-band NR-DC between FR1 and FR2, and inter-band NR CA between FR1 and FR2.

### 9.1.1 Applicability of requirements

The following applicability rules are specified for demodulation performance requirements for interworking:

- For UEs supporting both SA and NSA,

- The performance requirements specified in Clause 5 will be verified only for SA except for the sustained downlink data rate test specified in Clause 5.5 and 5.5A.

- The performance requirements specified in Clause 7 will be verified only for SA except for the sustained downlink data rate test specified in Clause 7.5 and 7.5A.

- The sustained downlink data rate tests specified in Clauses 5.5, 5.5A and 7.5, 7.5A for SA and in Clause 9.4B for NSA are verified separately.

- The FR1 EN-DC test cases with the NR TDD DL-UL configurations which are not aligned with LTE's can be tested on the corresponding EN-DC band combinations where UE supports simultaneous transmission and reception.

- For UEs supporting NR FR1 CA and/or NR CA including FR1 and FR2, the requirements applicability is specified in Table 9.1.1-1.

Table 9.1.1-1: Requirements applicability for UEs supporting NR FR2 CA and NR CA including FR1 and FR2

|  |  |
| --- | --- |
| Supported scenarios | Requirements |
| NR FR2 CA | Clause 7.5A |
| NR CA including FR1 and FR2 | Clause 9.4A.1 |
| Both NR FR2 CA and NR CA including FR1 and FR2 | Clause 7.5A |

- For UEs supporting EN-DC including FR2 and/or EN-DC including FR1 and FR2, the requirements applicability is specified in Table 9.1.1-2.

Table 9.1.1-2: Requirements applicability for UEs supporting EN-DC including FR2 and EN-DC including FR1 and FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Supported scenarios | SDR requirements | PDSCH requirements | PDCCH requirements |
| EN-DC including FR2 | Clause 9.4B.1.2 | Clause 9.2B.1.2 | Clause 9.3B.1.2 |
| EN-DC including FR1 and FR2 | Clause 9.4B.1.3 | Clause 9.2B.1.3 | Clause 9.3B.1.3 |
| Both EN-DC including FR2 and EN-DC including FR1 and FR2 | Clause 9.4B.1.2 | Clause 9.2B.1.2 | Clause 9.3B.1.2 |

- For UEs supporting NR-DC including FR1 and FR2, if the FR2 requirements in Clause 7.2 and Clause 7.3 are tested, the test coverage can be considered fulfilled without executing requirements in Clause 9.2B.2 and Clause 9.3B.2.

- For UEs supporting NR-DC between FR1 and FR2, if requirements in Clause 9.4A.1 are tested under same or higher data rate as in Clause 9.4B.2, the test coverage can be considered fulfilled without executing the requirements in Clause 9.4B.2.

- For UEs supporting NE-DC and EN-DC, the test coverage of demodulation performance requirements can be considered fulfilled, if the demodulation requirements in Clause 5 and Clause 9.4B.1 are executed for UE under test in the standalone mode.

- For UEs supporting NE-DC and not supporting EN-DC, the test coverage of demodulation performance requirements can be considered fulfilled, if the demodulation requirements in Clause 5 and Clause 9.4B.3 are executed for UE under test.

- For UEs supporting NGEN-DC, the test coverage of demodulation performance requirements can be considered fulfilled, if the demodulation requirements in Clause 5 and Clause 9.4B.1 are executed for UE under test.

- For UEs supporting FR1 intra-band contiguous and non-contiguous EN-DC, the requirements applicability is specified in Table 9.1.1-3.

Table 9.1.1-3: Requirements applicability for UE supporting FR1 intra-band and inter-band EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
|  | Inter-band scenarios are not supported | UE indicates “interBandContiguousMRDC” (Note 1, Note 2) | UE does not indicate “interBandContiguousMRDC” (Note 1, Note 3) |
| Intra-band scenarios are not supported | N/A | Clause 9.5B.1.1 is executed for inter-band EN-DC scenarios | Clause 9.5B.1.2 is executed for inter-band EN-DC scenarios |
| UE does not indicate “intraBandENDC-Support” or UE indicates “both” in “intraBandENDC-Support” (Note 4) | Clause 9.5B.1.1 is only executed for intra-band EN-DC scenarios | Clause 9.5B.1.1 is executed for both intra-band and inter-band EN-DC scenarios | Clause 9.5B.1.1 is only executed for intra-band EN-DC scenarios |
| UE indicates “non-contiguous” in “intraBandENDC-Support” (Note 5) | Clause 9.5B.1.2 is only executed for intra-band EN-DC scenarios | Clause 9.5B.1.1 is executed for inter-band EN-DC scenarios | Clause 9.5B.1.2 is executed for both intra-band and inter-band EN-DC scenarios |
| Note 1: Requirements are applicable to intra-band scenarios and only inter-band scenarios from Table 5.5B.4.1-1 of TS 38.101-3 [8] for which Note 4 is applied.  Note 2: UE supports both intra-band contiguous and non-contiguous EN-DC requirements for supported inter-band EN-DC combinations.  Note 3: UE supports intra-band non-contiguous EN-DC requirements for supported inter-band EN-DC combinations.  Note 4: UE supports intra-band contiguous EN-DC, or both intra-band contiguous and non-contiguous EN-DC for supported intra-band EN-DC combinations.  Note 5: UE supports only intra-band non-contiguous EN-DC for supported intra-band EN-DC combinations. | | | |

***<End of change39>***

***<Start of change40>***

A.3.2.1.1 Reference measurement channels for SCS 15 kHz FR1

<SKIP UNCHANGED PART>

Table A.3.2.1.1-1: PDSCH Reference Channel for FDD (QPSK)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.1-1.1 FDD | R.PDSCH.1-1.2 FDD | R.PDSCH.1-1.3 FDD | R.PDSCH.1-1.4 FDD |  |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |
| Number of allocated resource blocks | PRBs | 52 | 6 | 52 | 52 |  |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 7 | 12 |  |
| Allocated slots per 2 frames | Slots | 19 | 19 | 19 | 19 |  |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAMLowSE |  |
| MCS index |  | 4 | 4 | 4 | 14 |  |
| Modulation |  | QPSK | QPSK | QPSK | QPSK |  |
| Target Coding Rate |  | 0.30 | 0.30 | 0.30 | 0.59 |  |
| Number of MIMO layers |  | 1 | 1 | 1 | 1 |  |
| Number of DMRS REs |  | 18 | 12 | 12 | 12 |  |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 3904 | 480 | 2280 | 8064 |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | Bits | 24 | 16 | 16 | 24 |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i = 0 | CBs | N/A | N/A | N/A | N/A |  |
| For Slots i = 1,…, 19 | CBs | 1 | 1 | 1 | 1 |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i = 0 | Bits | N/A | N/A | N/A | N/A |  |
| For Slots i = 10, 11 | Bits | 12480 | 1512 | 6864 | 13104 |  |
| For Slots i =1,…, 9, 12, …, 19 | Bits | 13104 | 1584 | 7488 | 13728 |  |
| Max. Throughput averaged over 2 frames | Mbps | 3.709 | 0.456 | 2.166 | 7.661 |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

Table A.3.2.1.1-2: PDSCH Reference Channel for FDD (16QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** |  | **Value** | | | | | |
| Reference channel | |  | R.PDSCH.1-2.1 FDD | | R.PDSCH.1-2.2 FDD | R.PDSCH.1-2.3 FDD | R.PDSCH.1-2.4 FDD | R.PDSCH.1-  2.5 FDD | R.PDSCH.1-2.6 FDD |
| Channel bandwidth | | MHz | 10 | | 10 | 10 | 10 | 10 | 10 |
| Subcarrier spacing | | kHz | 15 | | 15 | 15 | 15 | 15 | 15 |
| Number of allocated resource blocks | | PRBs | 52 | | 52 | 52 | 52 | 52 | 52 |
| Number of consecutive PDSCH symbols | |  | 12 | | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames | | Slots | 19 | | 19 | 19 | 19 | 19 | 19 |
| MCS table | |  | 64QAM | | 64QAM | 64QAM | 64QAM | 64QAMLowSE | 64QAM |
| MCS index | |  | 13 | | 13 | 13 | 13 | 19 | 16 |
| Modulation | |  | 16QAM | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | |  | 0.48 | | 0.48 | 0.48 | 0.48 | 0.54 | 0.64 |
| Number of MIMO layers | |  | 1 | | 2 | 3 | 4 | 2 | 1 |
| Number of DMRS REs | |  | 12 | | 12 | 24 | 24 | 12 | 12 |
| Overhead for TBS determination | |  | 0 | | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot | |  |  | |  |  |  |  |  |
| For Slot i = 0 | | Bits | N/A | | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | | Bits | 13064 | | 26120 | 35856 | 48168 | 29704 | 17424 |
| Transport block CRC per Slot | |  |  | |  |  |  |  |  |
| For Slot i = 0 | | Bits | N/A | | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | | Bits | 24 | | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot | |  |  | |  |  |  |  |  |
| For Slot i = 0 | | CBs | N/A | | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 1,…, 19 | | CBs | 2 | | 4 | 5 | 6 | 4 | 3 |
| Binary Channel Bits Per Slot | |  |  | |  |  |  |  |  |
| For Slot i = 0 | | Bits | N/A | | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 10, 11 | | Bits | 26208 | | 52416 | 71136 | 94848 | 49920 | 26208 |
| For Slots i = 1,…, 9, 12, …, 19 | | Bits | 27456 | | 54912 | 74880 | 99840 | 54912 | 27456 |
| Max. Throughput averaged over 2 frames | | Mbps | 12.411 | | 24.814 | 34.063 | 45.760 | 28.219 | 16.553 |
|  | Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | | | |

***<End of change40>***

***<Start of change41>***

A.3.2.2.2 Reference measurement channels for SCS 30 kHz FR1

<SKIP UNCHANGED PART>

Table A.3.2.2.2-2: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 (16QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | | |
| Reference channel |  | R.PDSCH.2-2.1 TDD | R.PDSCH.2-2.2 TDD | R.PDSCH.2-2.3 TDD | R.PDSCH.2-2.4 TDD | R.PDSCH.2-2.5 TDD | R.PDSCH.2-2.6 TDD |
| Channel bandwidth | MHz | 40 | 40 | 40 | 40 | 40 | 40 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 106 | 106 | 106 | 106 | 106 | 106 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 4 | 4 | 4 | 4 | 4 | 4 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated slots per 2 frames |  | 31 | 31 | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAMLowSE | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 | 19 | 16 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 | 0.54 | 0.64 |
| Number of MIMO layers |  | 1 | 2 | 3 | 4 | 2 | 1 |
| Number of DMRS Res |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | 6 | 6 | 12 | 12 | 6 | 6 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 | 24 | 24 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 8456 | 16896 | 22032 | 29192 | 19464 | 11528 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | Bits | 26632 | 53288 | 73776 | 98376 | 60456 | 35856 |
| Transport block CRC per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6}for i from {1,…,39} | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | 2 | 3 | 3 | 4 | 3 | 2 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} | CBs | 4 | 7 | 9 | 12 | 8 | 5 |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 10) = {8,9} for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Slots i = 20, 21 | Bits | 53424 | 106848 | 144008 | 193344 | 101760 | 53424 |
| For Slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | 17808 | 35616 | 45792 | 61056 | 35616 | 17808 |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 55968 | 111936 | 152640 | 203520 | 111936 | 55968 |
| Max. Throughput averaged over 2 frames | Mbps | 37.644 | 75.318 | 104.004 | 138.646 | 85.508 | 50.711 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | | |

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**Table A.3.2.2.2-16: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.PDSCH.2-16.1 TDD | R.PDSCH.2-16.2 TDD |  |  |  |
| Channel bandwidth | MHz | 40 | 40 |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 |  |  |  |
| Allocated resource blocks | PRBs | 106 | 106 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0, 7} for i from {0,…,39} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Allocated slots per 2 frames |  | 24 | 24 |  |  |  |
| MCS table |  | 64QAMLowSE | 64QAMLowSE |  |  |  |
| MCS index |  | 19 | 19 |  |  |  |
| Modulation |  | 16QAM | 16QAM |  |  |  |
| Target Coding Rate |  | 0.54 | 0.54 |  |  |  |
| Number of MIMO layers |  | 1 | 1 |  |  |  |
| Number of DMRS REs |  |  | 12 |  |  |  |
| For Slot i, if mod(i, 10) = {0, 7} for i from {0,…,39} |  | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} |  | 12 | 12 |  |  |  |
| Overhead for TBS determination |  | 0 | 0 |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} | Bits | 30216 | 30216 |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} | Bits | 24 | 24 |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | CBs | N/A | N/A |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,39} | CBs | 4 | 4 |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 10) = {0,7,8,9} for i from {0,…,39} | Bits | N/A | N/A |  |  |  |
| For Slot i = 21 | Bits | 53424 | 50880 |  |  |  |
| For Slot i, if mod(i, 10) = {1,2,3,4,5,6} for i from {1,…,19,22,…,39} | Bits | 55968 | 55968 |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 18.130 (NOTE 3) | 18.130 (NOTE 4) |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Throughput is calculated under assumption of aggregation factor 2.  Note 4: Throughtput is calculated under assumption of repettion number 2 | | | | | | |

**Table A.3.2.2.2-17: PDSCH Reference Channel for TDD UL-DL pattern FR1.30-2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.2-17.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 40 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} |  | 2 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} |  | N/A |  |  |  |  |
| Allocated slots per 2 frames |  | 8 |  |  |  |  |
| MCS table |  |  |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |
| Target Coding Rate |  | 0.3 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} |  | 6 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} |  | N/A |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 1160 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | N/A |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 16 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | N/A |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | CBs | 1 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | CBs | N/A |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slot i, if mod(i, 5) = 3 for i from {0,…,39} | Bits | 3816 |  |  |  |  |
| For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,39} | Bits | N/A |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 0.464 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames | | | | | | |

**Table A.3.2.2.2-18: PDSCH Reference Channel for PDSCH on band with shared spectrum access with TDD UL-DL pattern FR1.30-7**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | |
| Reference channel |  | R.PDSCH.2-18.1 TDD | R.PDSCH.2-18.2 TDD | R.PDSCH.2-18.3 TDD | R.PDSCH.2-18.4 TDD |
| Channel bandwidth | MHz | 20 | 40 | 60 | 80 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 |
| Allocated resource blocks | PRBs | 51 | 106 | 162 | 217 |
| Number of consecutive PDSCH symbols |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) =7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | symbol | {4,7,10,12} | {4,7,10,12} | {4,7,10,12} | {4,7,10,12} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | symbol | 12 | 12 | 12 | 12 |
| 3  Allocated slots per 2 frames | slot | 31 | 31 | 31 | 31 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 13 | 13 | 13 | 13 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 0.48 | 0.48 | 0.48 | 0.48 |
| Number of MIMO layers |  | 2 | 2 | 2 | 2 |
| Number of DMRS REs |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} |  | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | symbol | {6,6,12,12} | {6,6,12,12} | {6,6,12,12} | {6,6,12,12} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | symbol | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | Bits | {8192,14088， 16392,25608} | {16896,29192,44040,53288} | {26120,45096, 67584,81976,} | {34816,60456, 90176,110632} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | Bits | 25608 | 53288 | 81976 | 110632 |
| Transport block CRC per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {1,…,39} (Note 5) | Bits | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | CBs | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | CBs | {1,2,4,4} | {3,4,6,7} | {4,6,9,10} | {5,8,11,14} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | CBs | 4 | 7 | 10 | 14 |
| Binary Channel Bits Per Slot |  |  |  |  |  |
| For Slot 0 and slot i, if mod(i, 10) = 7 for i from {0,…,39} | Bits | N/A | N/A | N/A | N/A |
| For Slot i, if mod(i, 10) = {3, 5, 6} for i from {1,…,39} (Note 3, 5) | Bits | {17136,29376,44064,53865} | {35616,61056,91854,11193} | {54432,93312,  139968,171072} | {72912,124992,187488,229152} |
| For Slot i, if mod(i, 10) = {0, 1, 2, 4} for i from {1,…,39} (Note 5) | Bits | 53865 | 111936 | 171073 | 229152 |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: For {a1,a2,a3,a4 }, a1, a2, a3 and a4 stand for the setup when the number of OFDM symbols is 6,9,12,14 respectively. It applies only to the last slot within the Downlink Transmission duration (specified in Annex B.5). For all other slots the setup when the number of OFDM symbols is 14 should apply.  Note 4: The slot i, mod (i,10)=9 is idle slot with no UL transmission.  Note 5: The per Slot value applies only to slots included within the Downlink Transmission duration. For all other slots not included in the Downlink Transmission Duration, N/A should apply | | | | | |

***<End of change41>***

***<Start of change42>***

A.3.2.2.5 Reference measurement channels for SCS 120 kHz FR2

<SKIP UNCHANGED PART>

**Table A.3.2.2.5-11: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | |
| Reference channel |  | R.PDSCH.5-11.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |
| Allocated resource blocks | PRBs | 66 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} |  | 13 |  |  |  |  |
| Allocated slots per 2 frames |  | 78 |  |  |  |  |
| MCS table |  | 64QAMLowSE |  |  |  |  |
| MCS index |  | 16 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.37 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 6 |  |  |  |  |
| Information Bit Payload per Slot |  |  |  |  |  |  |
| For Slots 0, 1 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | Bits | 13320 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
| For Slots 0, 1 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
| For Slots 0, 1 and Slot i, if mod(i, 4) = {2,3} for i from {0,…,159} | CBs | N/A |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots 0,1 and Slot i, if mod(i, 4) = {2, 3} for i from {0,…,159} | Bits | N/A |  |  |  |  |
| For Slot i = 80, 81 | Bits | 34980 |  |  |  |  |
| For Slot i, if mod(i, 4) = {0,1} for i from {2,…,159} | Bits | 36564 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 25.974 (Note 3) |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 ms  Note 2: Slot i is slot index per 2 frames  Note 3: Throughput is calculated under assumption of aggregation factor 2. | | | | | | |

***<End of change42>***