**3GPP TSG-RAN4 Meeting # 111 *R4-2409980***

**Fukuoka City, Fukuoka, Japan, 20th – 24th May 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.174** | **CR** | **Draft CR** | **rev** | **-** | **Current version:** | **18.4.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | draft CR to 38.174: Introduction of mIAB-MT conducted performance requirement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_mobile\_IAB-Perf | | | | |  | ***Date:*** | | | 2024-05-13 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)*  *Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introducing the minimum conducted requirements of mIAB-MT | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Introduce a new clause 8.2.2B for conducted demodulation and 8.2.3B for CSI reporting requirement for mIAB-MT | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The minimum conducted requirement of demodulation and CQI reporting for mIAB-MT is missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2.2B, 8.2.3B (New) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.176-1, 38.176-2 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Resubmission of the endorsed draft CR | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

----------------------------------------------------- Beginning of Change 1------------------------------------------------------------

### 8.2.2B Demodulation performance requirements for Mobile IAB

#### 8.2.2B.1 Performance requirements for PDSCH

##### 8.2.2B.1.1 General

The performance requirement of PDSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in annex A. The performance requirements assume HARQ retransmissions.

Table: 8.2.2B.1.1-1 Test parameters for testing PDSCH

|  |  |  |  |
| --- | --- | --- | --- |
| **~~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)~~ |  | ~~Specific to each Reference channel~~ |
| ~~PDSCH aggregation factor~~ |  | ~~1~~ |
| ~~PRB bundling type~~ |  | ~~Static~~ |
| ~~PRB bundling size~~ |  | ~~4 for Tests 1-1, 2 for Test 1-2~~ |
| ~~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~~ |  | ~~2 for Tests 1-1 1 for Test 1-2~~ |
| ~~Maximum number of OFDM symbols for DL front loaded DMRS~~ |  | ~~1~~ |
| ~~CSI-RS for tracking~~ | ~~First OFDM symbol in the PRB used for CSI-RS~~ |  | ~~Table 5.2-1.~~ |
| ~~CSI-RS periodicity~~ | ~~Slots~~ | ~~Table 5.2-1.~~ |
| ~~CSI-RS offset~~ | ~~Slots~~ | ~~Table 5.2-1.~~ |
| ~~Frequency Occupation~~ |  | ~~Table 5.2-1.~~ |
| ~~Number of HARQ Processes~~ | |  | ~~16 for Test 1-2~~  ~~8 for Test 1-1~~ |
| ~~The number of slots between PDSCH and corresponding HARQ-ACK information~~ | |  | ~~Specific to each TDD UL-DL pattern and as defined in Annex A.1.2~~ |

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Cyclic prefix | | Normal |
| Default TDD UL-DL pattern (Note 1) | | 7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 4 |
| RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| DM-RS position (*l0*) | 2 |
| Additional DM-RS position | pos1 for test 1-1  pos1 and pos2 for test 1-2 |
| Number of DM-RS CDM group(s) without data | 1 |
| DM-RS port(s) | {1000} |
| DM-RS sequence generation | NID0=0 |
| Time domain resource assignment | PDSCH mapping type | A |
| Start symbol | 2 |
| Allocation length | 12 |
| Frequency domain resource assignment | RB assignment | Full applicable test bandwidth |
| PT-RS configuration | | Not configured |
| PRB bundling size | | 2 |
| VRB-to-PRB mapping type | | Not interleaved |
| PDSCH & PDSCH DMRS Precoding configuration | | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with PRB bundling granularity |
| Note 1: The same requirements are applicable to TDD with different UL-DL patterns. | | |

##### 8.2.2B.1.2 Minimum requirements

The throughput shall be equal to or larger than the fraction of maximum throughput for the FRCs stated in tables 8.2.2B.1.2-1 at the given SNR with the test parameters stated in Table 8.2.2B.1.1-1.

Table 8.2.2B.1.2-1: 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.2-1.1 TDD~~ | ~~40 / 30~~ | ~~QPSK, 0.30~~ | ~~FR1.30-5~~ | ~~TDLB100-400~~ | ~~2x4, ULA Low~~ | ~~70~~ | ~~-4.0~~ |
| ~~1-2~~ | ~~R.PDSCH.2-2.1 TDD~~ | ~~40 / 30~~ | ~~16QAM, 0.48~~ | ~~FR1.30-1~~ | ~~TDLC300-100~~ | ~~2x4, ULA Low~~ | ~~30~~ | ~~-1.2~~ |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test number | FRC (Annex A) | Bandwidth (MHz) / Subcarrier spacing (kHz) | Propagation conditions | Antenna configuration | Fraction of maximum throughput (%) | SNR  (dB) |
| 1-1 | M-FR1-A.3B.1-1 | 40/30 | TDLB100-400 | 2x4, ULA Low | 70 | -4.0 |
| 1-2 | M-FR1-A.3B.2-1 | 40/30 | TDLC300-100 | 2x4, ULA Low | 30 | -1.2 |

#### 8.2.2B.2 Performance requirements for PDCCH

##### 8.2.2B.2.1 General

The receiver characteristics of the PDCCH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

Table: 8.2.2B.2.1-1 Test parameters for testing PDCCH

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~Parameter~~** | **~~Unit~~** | **~~1 Tx Antenna~~** | | **~~2 Tx Antenna~~** |
| ~~TDD UL-DL pattern~~ |  | ~~FR1.30-1~~ | | |
| ~~CCE to REG mapping type~~ |  | ~~interleaved~~ | ~~interleaved~~ | |
| ~~Interleaver size~~ |  | ~~3~~ | | |
| ~~REG bundle size~~ |  | ~~2~~ | ~~6~~ | |
| ~~Shift Index~~ |  | ~~0~~ | | |

|  |  |
| --- | --- |
| Parameter | Value |
| Cyclic prefix | Normal |
| Default TDD UL-DL pattern (Note 1) | 7D1S2U, S=6D:4G:4U |
| DM-RS sequence generation | NID=0 |
| Frequency domain resource allocation for CORESET | Start from RB = 0 with contiguous RB allocation |
| CCE to REG mapping type | Interleaved |
| Interleaver size | 3 |
| REG bundle size | 2 for test with 1Tx 6 for test with 2Tx |
| Shift Index | 0 |
| Slots for PDCCH monitoring | Each slot |
| Number of PDCCH candidates for the tested aggregation level | 1 |
| PDCCH Precoding configuration | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination with REG bundling granularity for number of Tx larger than 1 |
| Note 1: The same requirements are applicable to TDD with different UL-DL patterns. | |

##### 8.2.2B.2.2 Minimum requirements

The Pm-dsg shall be equal to or smaller than 1%, for the cases stated in Table 8.2.2B.2.2-1 at the given SNR with the test parameters stated in Table 8.2.2B.2.1-1.

Table 8.2.2B.2.2-1: Minimum requirements for PDCCH 1Tx

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **~~Test number~~** | **~~Bandwidth (MHz)~~** | **~~CORESET RB~~** | **~~CORESET duration~~** | **~~Aggregation level~~** | **~~Reference Channel~~** | **~~Propagation Condition~~** | **~~Antenna configuration and correlation Matrix~~** | **~~Reference value~~** | |
| **~~Pm-dsg (%)~~** | **~~SNR (dB)~~** |
| ~~1~~ | ~~40~~ | ~~102~~ | ~~1~~ | ~~4~~ | ~~R.PDCCH. 2-1.2 TDD~~ | ~~TDLC300-100~~ | ~~1x4 Low~~ | ~~1~~ | ~~-0.9~~ |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test number | Bandwidth (MHz) / Subcarrier spacing (kHz) | CORESET RB | CORESET duration | Aggregation level | FRC (Annex A) | Propagation conditions (Annex I) | Antenna configuration | Pm-dsg (%) | SNR  (dB) |
| 1 | 40/30 | 102 | 1 | 4 | M-FR1-A.3B.4-1 | TDLC300-100 | 1x4 Low | 1 | -0.9 |

Table 8.2.2B.2.2-2: Minimum requirements for PDCCH 2Tx

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **~~Test number~~** | **~~Bandwidth (MHz)~~** | **~~CORESET RB~~** | **~~CORESET duration~~** | **~~Aggregation level~~** | **~~Reference Channel~~** | **~~Propagation Condition~~** | **~~Antenna configuration and correlation Matrix~~** | **~~Reference value~~** | |
| **~~Pm-dsg (%)~~** | **~~SNR (dB)~~** |
| ~~1~~ | ~~40~~ | ~~90~~ | ~~1~~ | ~~8~~ | ~~R.PDCCH. 2-1.3 TDD~~ | ~~TDLC300-100~~ | ~~2x4 Low~~ | ~~1~~ | ~~-4.3~~ |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test number | Bandwidth (MHz) / Subcarrier spacing (kHz) | CORESET RB | CORESET duration | Aggregation level | FRC (Annex A) | Propagation conditions (Annex I) | Antenna configuration | Pm-dsg (%) | SNR  (dB) |
| 1 | 40/30 | 90 | 1 | 8 | M-FR1-A.3B.4-2 | TDLC300-100 | 2x4 Low | 1 | -4.3 |

#### 8.2.2B.3 Performance requirements for PBCH

##### 8.2.2B.3.1 General

The receiver characteristics of PBCH are determined by the probability of miss-detection of the PBCH (Pm-bch), which is defined as

Where A is the number of correctly decoded MIB PDUs and B is the number of transmitted MIB PDUs. The Pm-bch is derived with the assumption UE combines the PBCH symbols of the same SS/PBCH block index within the MIB TTI (80ms).

Table 8.2.2B.3.1-1: Common test Parameters

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Single antenna port |
| Physical Cell ID |  | 0 |
| Cyclic prefix |  | Normal |
| Number of SS/PBCH blocks within an SS burst set periodicity |  | 1 |
| SS/PBCH block index Note1 |  | 0 |
| SS/PBCH block periodicity | ms | 20 |
| Note 1: as specified in clause 4.1 of TS 38.213 [11] | | |

##### 8.2.2B.3.2 Minimum requirements

Table 8.2.2B.3.2-1: Test parameters for PBCH

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Single antenna port |
| TDD UL-DL pattern |  | FR1.30-1 |

For the parameters specified in Table 8.2.2B.3.1-1 and Table 8.2.2B.3.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified values in Table 8.2.2B.3.2-2 in case SS/PBCH block index is not known and below the specified values in Table. 8.2.2B.3.2-3 in case SS/PBCH block index is known. The downlink physical setup is in accordance with Annex C.3.1 in 38.101-4 [28].

Table 8.2.2B.3.2-2: Minimum performance PBCH in case SS/PBCH block index is not known

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test number | Bandwidth (MHz) / Subcarrier spacing (kHz) | Reference channel | Propagation condition | Antenna configuration and correlation matrix | Reference value | |
| Pm-bch (%) | SNR (dB) |
| 1 | 40 / 30 | M.PBCH.1 | TDLA30-10 | 1 x 4 Low | 1 | -8.6 |

Table 8.2.2B.3.2-3: Minimum performance PBCH in case SS/PBCH block index is known

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test number | Bandwidth (MHz) / Subcarrier spacing (kHz) | Reference channel | Propagation condition | Antenna configuration and correlation matrix | Reference value | |
| Pm-bch (%) | SNR (dB) |
| 1 | 40 / 30 | M.PBCH.1 | TDLA30-10 | 1 x 4 Low | 1 | -9.6 |

### 8.2.3B CSI reporting requirements for Mobile IAB

#### 8.2.3B.1 General

This clause includes conducted requirements for the reporting of channel state information (CSI).

##### 8.2.3B.1.1 Common test parameters

Parameters specified in Table 8.2.3B.1.1-1 are applied for all test cases in clause 8.2.3B unless otherwise stated.

Table 8.2.3B.1.1-1: Test parameters for CSI test cases

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
| PDSCH transmission scheme | |  | Transmission scheme 1 |
| Duplex mode | |  | TDD |
| Actual carrier configuration | Offset between Point A and the lowest usable subcarrier on this carrier (Note 2) | RBs | 0 |
| Subcarrier spacing | kHz | 30 |
| DL BWP configuration #1 | Cyclic prefix |  | Normal |
| RB offset | RBs | 0 |
| Number of contiguous PRB | PRBs | Maximum transmission bandwidth configuration as specified in clause 5.3.2 for tested channel bandwidth and subcarrier spacing |
| Active DL BWP index | |  | 1 |
| Cross carrier scheduling | |  | Not configured |
| 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 |
| 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 |
| DMRS ports indexes |  | {1000} for Rank1 |
| Number of PDSCH DMRS CDM group(s) without data |  | 2 |
| PTRS configuration | Frequency density (*KPT-RS*) |  | N/A |
| Time density (*LPT-RS*) |  | N/A |
| NZP CSI-RS for CSI acquisition | Frequency Occupation |  | Start PRB 0  Number of PRB = BWP size |
| Redundancy version coding sequence | |  | {0,2,3,1} |
| Physical signals, channels mapping and precoding | |  | As specified in Annex I.3.1 |
| Note 1: PDSCH is not scheduled on slots containing CSI-RS or slots which are not full DL.  Note 2: Point A coincides with minimum guard band as specified in Table 5.3.3-1 from TS 38.101-1 [3] for tested channel bandwidth and subcarrier spacing. | | | |

#### 8.2.3B.2 Reporting of Channel Quality Indicator (CQI)

##### 8.2.3B.2.1 General

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective conditions is determined by the reporting variance and the BLER performance using the transport format indicated by the reported CQI median. The purpose is to verify that the reported CQI values are in accordance with the CQI definition given in TS 38.214 [11]. 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.

##### 8.2.3B.2.2 Minimum requirements for wideband CQI reporting

The purpose of the requirements is to verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for the frequency non-selective scheduling.

The reporting accuracy of CQI under frequency non-selective fading conditions is determined by the reporting variance, the relative increase of the throughput obtained when the transport format is indicated by the reported CQI compared to the throughput obtained when a fixed transport format is configured according to the reported median CQI, and a minimum BLER using the transport formats indicated by the reported CQI. 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 8.2.3B.2.2-1 and using the downlink physical channels specified in Annex C.3.1 in TS 38.101-4[28], the minimum requirements are specified by the following:

a) A CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least *α*% of the time where *α*% is specified in Table 8.2.3B.2.2-2;

b) The ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be ≥ *γ*, where *γ* is specified in Table 8.2.3B.2.2-2;

c) When transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater than or equal to 0.02.

Table 8.2.3B.2.2-1: Wideband CQI reporting test under frequency non-selective fading conditions

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | **Test 2** | | |
| Bandwidth | | | MHz | 40 | | | | |
| Subcarrier spacing | | | kHz | 30 | | | | |
| Default TDD UL-DL pattern (Note 1) | | |  | 7D1S2U, S=6D:4G:4U | | | | |
| SNR | | | dB | 3 | 4 | 9 | 10 | |
| Propagation channel | | |  | TDLA30-5 | | | | |
| Antenna configuration | | |  | 2×4 | | | | |
| Beamforming Model | | |  | As specified in Annex I | | | | |
| 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 | | |  | TBD | | | | |
| Note 1: The same requirements are applicable for TDD with different UL-DL pattern.  Note 2: SSB, TRS, CSI-RS, and/or other unspecified test parameters with respect to TS 38.101-4 [28] are left up to test implementation, if transmitted or needed. | | | | | | | |

Table 8.2.3B.2.2--2: Minimum requirements

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Test 1** | **Test 2** |
| *a* [%] | 5 | 5 |
| *g* | 1.05 | 1.05 |

##### 8.2.3B.2.3 Minimum requirements for sub-band CQI reporting

The purpose of the requirements is to verify that the preferred sub-bands can be used for frequency-selective scheduling under the frequency-selective fading conditions.

The accuracy of sub-band channel CQI reporting under the frequency-selective fading conditions is determined by a double-sided percentile of the reported differential CQI offset level 0 per sub-band, and the relative increase of the throughput obtained when transmitting the transport format indicated by the corresponding reported sub-band CQI on a randomly selected sub-band among the sub-bands with the highest reported differential CQI offset level compared to the throughput when transmitting a fixed transport format according to the wideband CQI median on a randomly selected sub-band among all the sub-bands. To account for sensitivity of the input SNR the sub-band CQI reporting under frequency selective fading conditions 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 8.2.3B.2.3-1 and using the downlink physical channels specified in Annex C.3.1 in TS 38.101-4[28], the minimum requirements are specified by the following:

a) A sub-band differential CQI offset level of 0 shall be reported at least α% of the time but less than β% of the time for each sub-band, where α and β are specified in Table 8.2.3B.2.3-2;

b) The ratio of the throughput obtained when transmitting the corresponding transport format on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level and that obtained when transmitting the transport format indicated by the reported wideband CQI median on a randomly selected sub-band among all the sub-bands shall be ≥ *γ*, where *γ* is specified in Table 8.2.3B.2.3-2;

c) When transmitting the corresponding transport format on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level, the average BLER for the indicated transport format shall be greater than or equal to 0.02.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance for TDD.

Table 8.2.3B.2.3-1: Sub-band CQI reporting test under frequency-selective fading conditions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | **Test 2** | |
| Bandwidth | | | MHz | 40 | | | |
| Subcarrier spacing | | | kHz | 30 | | | |
| Default TDD UL-DL pattern (Note 1) | | |  | 7D1S2U, S=6D:4G:4U | | | |
| 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 | | | |
| Beamforming Model | | |  | As specified in Annex I | | | |
| 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 | | |  | TBD | | | |
| Note 1: The same requirements are applicable for TDD with different UL-DL pattern.  Note 2: SSB, TRS, CSI-RS, and/or other unspecified test parameters with respect to TS 38.101-4 [28] are left up to test implementation, if transmitted or needed. | | | | | | | |

Table 8.2.3B.2.3-2: Minimum requirements

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Test 1** | **Test 2** |
| *α* [%] | 2 | 2 |
| *β* [%] | 55 | 55 |
| *g* | 1.05 | 1.05 |

-----------------------------------------------------------End of change 1---------------------------------------------------------------