**3GPP TSG-RAN4 Meeting #111 *R4-2409485***

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

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.176-1** | **CR** | **-** | **rev** | **1** | **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 | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** | Draft CR on mIAB-MT conducted performance requirement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_mobile\_IAB-Perf | | | | |  | ***Date:*** | | | 2024-05-10 |
|  |  | | | |  | |  | | |  |
| ***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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In Rel-18 mIAB WI, it was agreed to introduce the requirement of mIAB-MT | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add the new section in 8.2 for mIAB-MT requirement | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The requirement of mIAB-MT can not be verified well | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.3.2.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.176-2 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR … CR … | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR’s revision history:*** | | Revision of R4-2409485 | | | | | | | | |

#### **<< Unchanged sections omitted >>**

### 8.2.2B Demodulation performance requirements for mIAB

#### 8.2.2B.1 General

##### 8.2.2B.1.1 Applicability of requirements

8.2.2B.1.1.1 General

Unless otherwise stated, for a mIAB-MT declared to support more than 2 demodulation branches (for *IAB-MT type 1-O* and *IAB-MT type 2-O*), the performance requirement tests for 2 demodulation branches shall apply, and the mapping between connectors and demodulation branches is up to mIAB-MT implementation.

The tests requiring more than [20] dB SNR level are set to N/A in the test requirements.

8.2.2B.1.1.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, the tests shall apply only for each subcarrier spacing declared to be supported (see D.14 in table 4.6-1).

8.2.2B.1.1.3 Applicability of requirements for TDD with different UL-DL patterns

Unless otherwise stated, for each subcarrier spacing declared to be supported, if mIAB-MT supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

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

##### 8.2.2B.2.1 Definition and applicability

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 re-transmissions.

##### 8.2.2B.2.2 Minimum requirement

The minimum requirement is in TS 38.174 [2] clause 8.2.2.1.XB.

##### 8.2.2B.2.3 Test purpose

The test shall verify the receiver's ability to achieve throughput under multipath fading propagation conditions for a given SNR.

##### 8.2.2B.2.4 Method of test

8.2.2B.2.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

8.2.2B.2.4.2 Procedure

1) Connect the IAB tester generating the wanted signal, multipath fading simulators and AWGN generators to all mIAB-MT *TAB connectors* for diversity reception via a combining network as shown in annex D.6.

2) Adjust the AWGN generator and adjust the AWGN power level to -77.2 dBm / 38.16MHz.

3) The characteristics of the wanted signal shall be configured according to the corresponding DL reference measurement channel defined in annex A and the test parameters in table 8.2.2B.2.4.2-1.

Table 8.2.2B.2.4.2-1: Test parameters for testing PDSCH

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
| Duplex mode | |  | TDD |
| Active BWP index | |  | 1 |
| Default TDD UL-DL pattern (Note 1) | |  | 7D1S2U, S=6D:4G:4U |
| PDSCH transmission scheme | |  | Transmission scheme 1 |
| Carrier configuration | Offset between Point A and the lowest usable subcarrier on this carrier (Note 1) | RBs | 0 |
|  | Subcarrier spacing | kHz | 30 |
| DL BWP configuration #1 | Cyclic prefix |  | Normal |
|  | RB offset | RBs | 0 |
|  | Number of contiguous PRB | PRBs | 106 |
| PDSCH DMRS configuration | Antenna ports indexes |  | {1000} for Rank 1 tests |
|  | Position of the first DMRS for PDSCH mapping type A |  | 2 |
| Number of PDSCH DMRS CDM group(s) without data |  | 1 for Rank 1 |
| DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 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 |  | 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 |
| PT-RS configuration | |  | PT-RS is not configured |
| Maximum number of code block groups for ACK/NACK feedback | |  | 1 |
| Maximum number of HARQ transmission | |  | 4 |
| HARQ ACK/NACK bundling | |  | Multiplexed |
| Redundancy version coding sequence | |  | {0,2,3,1} |
| 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.  Note 2: Point A coincides with minimum guard band as specified in TS 38.174 [2] for tested channel bandwidth and subcarrier spacing. | | | |

4) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex F.

5) Adjust the equipment so that required SNR specified in tables 8.2.2B.2.5.1-1 is achieved at the mIAB-MT input.

6) For each of the reference channels in tables 8.2.2B.2.5.1-1 applicable for the mIAB-MT, measure the throughput.

##### 8.2.2B.2.5 Test requirement

The throughput measured according to clause 8.2.2B.2.4.2 shall not be below the limits for the SNR levels specified in table 8.2.2B.2.5-1.

Table 8.2.2B.2.5-1: 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 | M-FR1-A3.3-1 | 40 / 30 | QPSK, 0.30 | TDLB100-400 | 2x4, ULA Low | 70 | -3.0 |
| 2 | M-FR1-A.3.1-1 | 40 / 30 | 16QAM, 0.48 | TDLC300-100 | 2x4, ULA Low | 30 | -0.2 |

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

##### 8.2.2B.3.1 Definition and applicability

The performance requirement of PDCCH is determined by a maximum allowed missed detection rate for a given SNR. The required missed detection rate is expressed for the FRCs listed in annex A.

##### 8.2.2B.3.2 Minimum requirement

The minimum requirement is in TS 38.174 [2] clause 8.2.2.2.

##### 8.2.2B.3.3 Test purpose

The test shall verify the receiver's ability to achieve missed detection rate under multipath fading propagation conditions for a given SNR.

##### 8.2.2B.3.4 Method of test

8.2.2B.3.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

8.2.2B.3.4.2 Procedure

1) Connect the IAB tester generating the wanted signal, multipath fading simulators and AWGN generators to all mIAB-MT *TAB connectors* for diversity reception via a combining network as shown in annex D.6.

2) Adjust the AWGN generator and adjust the AWGN power level to -77.2 dBm / 38.16MHz.

3) The characteristics of the wanted signal shall be configured according to the corresponding DL reference measurement channel defined in annex A and the test parameters in table 8.2.2.3.4.2-1.

Table 8.2.2B.3.4.2-1: Test parameters for testing PDCCH

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | 1 Tx Antenna | 2 Tx Antenna |
| CCE to REG mapping type |  | interleaved | interleaved |
| Interleaver size |  | 3 | |
| REG bundle size |  | 2 | 6 |
| Shift Index |  | 0 | |

4) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex F.

5) Adjust the equipment so that required SNR specified in tables 8.2.2B.3.5.1-1 is achieved at the mIAB-MT input.

6) For each of the reference channels in table 8.2.2B.3.5.1-1 applicable for the IAB-MT, measure the missed detection.

##### 8.2.2B.3.5 Test requirement

For the parameters specified in Table 8.2.2B.3.4.2.1-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.2.2B.3.5-1.

Table 8.2.2B.3.5-1: Minimum performance for PDCCH

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | M-FR1-A.3.4-2 | TDLC300-100 | 1x4 Low | 1 | 0.1 |
| 2 | 40 | 90 | 1 | 8 | M-FR1-A.3.4-3 | TDLC300-100 | 2x4 Low | 1 | -3.3 |

#### **<< Unchanged sections omitted >>**

### 8.2.3B CSI reporting requirements for mIAB

#### 8.2.3B.1 General

##### 8.2.3B.1.1 Applicability rule for mIAB-MT

###### 8.2.3B.1.1.1 General

Unless otherwise stated, for an mIAB-MT declared to support more than 4 *TAB connectors* (for *IAB type 1-H*), the performance requirement tests for 4 RX antennas shall apply, and the specific connectors used for testing is up to mIAB-MT implementation.

###### 8.2.3B.1.1.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, the tests shall apply only for each subcarrier spacing declared to be supported (see D.14 in table 4.6-1).

###### 8.2.3B.1.1.3 Applicability of requirements for TDD with different UL-DL patterns

Unless otherwise stated, for each subcarrier spacing declared to be supported, if IAB-MT supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

###### 8.2.3B.1.1.4 Applicability of requirements for mIAB-MT features

Unless otherwise stated, for *IAB type 1-H*, the CSI reporting tests shall apply only in case the number of NZP-CSI-RS ports in the test case satisfies maximum number of ports across all configured NZP-CSI-RS resources per CC declared to be supported (see D.201 in table 4.6-1*, maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC*).

Unless otherwise stated, for *IAB type 1-H*, the CSI reporting tests shall apply only in case the PDSCH MIMO rank in the test case does not exceed the maximum number of PDSCH MIMO layers declared to be supported (see D.202 in table 4.6-1*, maxNumberMIMO-LayersPDSCH*).

Note: Applicability information may be obtained based on vendor declaration (Section 4.6) or alternatively from reading capability signaling.

##### 8.2.3B.1.2 Common test parameters

Parameters specified in Table 8.2.3B.1.2-1 are applied for all test cases in this clause unless otherwise stated.

Table 8.2.3B.1.2-1: Test parameters for CSI test cases

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
| PDSCH transmission scheme | |  | Transmission scheme 1 |
| Duplex mode | |  | TDD |
| PTRS epre-Ratio | |  | N/A |
| Actual carrier configuration | Offset between Point A and the lowest usable subcarrier on this carrier (Note 3) | RBs | 0 |
| Subcarrier spacing | kHz | 30 |
| DL BWP configuration #1 | Cyclic prefix |  | Normal |
| RB offset | RBs | 0 |
| Number of contiguous PRB | PRBs | 106 |
| 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 |
| 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  {1000,1001} for Rank2  {1000,1001,1002} for Rank3  {1000,1001,1002,1003} for Rank4 |
| Number of PDSCH DMRS CDM group(s) without data |  | 2 |
| PTRS configuration | Frequency density (*KPT-RS*) |  | N/A |
| Time density (*LPT-RS*) |  | N/A |
| Resource Element Offset |  | 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} |
| 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 [23] for tested channel bandwidth and subcarrier spacing. | | | |

#### 8.2.3B.2 Reporting Channel Quality Indicator (CQI) for wideband CQI reporting

##### 8.2.3B.2.1 Definition and applicability

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 wideband 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.

Which specific test(s) are applicable to mIAB-MT is based on the test applicability rules defined in clause 8.2.1.2.

##### 8.2.3B.2.2 Minimum requirement

The minimum requirement is in TS 38.174 [2] clause 8.2.3.1.

##### 8.2.3B.2.3 Test purpose

The test shall verify the receiver's ability to report CQI values accordance with the CQI definition given in TS 38.214 [24].

##### 8.2.3B.2.4 Method of test

8.2.3B.2.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

8.2.3B.2.4.2 Test procedure

1) Connect the mIAB-MT tester generating the wanted signal and AWGN generators to all mIAB-MT *TAB* connectors for diversity reception via a combining network as shown in annex D.5 and D.6.

2) Adjust the AWGN generator, according to the channel bandwidth, defined in table 8.2.3B.2.4.2-1.

Table 8.2.3B.2.4.2-1: AWGN power level at the mIAB-MT input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 30 kHz | 40 | -77.2 dBm / 38.16MHz |

3) The characteristics of the wanted signal shall be configured according to the corresponding DL reference measurement channel defined in annex A and the test parameters in table 8.2.3B.2.4.2-2.

Table 8.2.3B.2.4.2-2: Test parameters for testing 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 | | | |

4) Adjust the equipment so that required SNR specified in table 8.2.3.2.4.2-2 is achieved at the mIAB-MT input.

5) For each test specified in table 8.2.3B.2.4.2-2 applicable for the IAB-MT, measure the median CQI and the BLER at median CQI and (median CQI+1 or median CQI-1) as per clause 8.2.3B.2.5.

##### 8.2.3B.2.5 Test requirement

For the parameters specified in Table 8.2.3B.2.4-2 and using the downlink physical channels specified in Annex C.3.1, 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.2.5-1;

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.2.5-1;

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.2.5-1: Minimum requirements

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Test 1** | **Test 2** |
| ** [%] | 5 | 5 |
| ** | 1.05 | 1.05 |

#### 8.2.3B.3 Reporting Channel Quality Indicator (CQI) for sub-band CQI reporting

##### 8.2.3B.3.1 Definition and applicability

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.

##### 8.2.3B.3.2 Minimum requirement

The minimum requirement is in TS 38.174 [2] clause 8.2.3.1.

##### 8.2.3B.3.3 Test purpose

The test shall verify the receiver's ability to report CQI values accordance with the CQI definition given in TS 38.214 [24].

##### 8.2.3B.3.4 Method of test

8.2.3B.3.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

8.2.3B.3.4.2 Test procedure

1) Connect the mIAB-MT tester generating the wanted signal and AWGN generators to all mIAB-MT *TAB* connectors for diversity reception via a combining network as shown in annex D.5 and D.6.

2) Adjust the AWGN generator, according to the channel bandwidth, defined in table 8.2.3B.3.4.2-1.

Table 8.2.3B.3.4.2-1: AWGN power level at the mIAB-MT input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 30 kHz | 40 | -77.2 dBm / 38.16MHz |

3) The characteristics of the wanted signal shall be configured according to the corresponding DL reference measurement channel defined in annex A and the test parameters in table 8.2.3B.3.4.2-2.

Table 8.2.3B.3.4.2-2: Test parameters for testing sub-band 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 | 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 | | |  | 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 | | | |

4) Adjust the equipment so that required SNR specified in table 8.2.3B.3.4.2-2 is achieved at the mIAB-MT input.

5) For each test specified in table 8.2.3B.3.4.2-2 applicable for the IAB-MT, measure the median CQI and the BLER at median CQI and (median CQI+1 or median CQI-1) as per clause 8.2.3B.3.5.

##### 8.2.3B.3.5 Test requirement

For the parameters specified in Table 8.2.3B.3.4-2 and using the downlink physical channels specified in Annex C.3.1, 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.3.5-1;

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.3.5-1;

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.3.5-1: Minimum requirements

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