**3GPP TSG- Meeting #**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Work item code:*** | NB\_IOTenh4\_LTE\_eMTC6-Perf | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of Rel-17 eMTC and NB-IoT UE demodulation and CQI reporting requirements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | R4-2214548: CR: Introduction of eMTC PDSCH requirmeents with 14 HARQ processes   1. Add the PDSCH performance requirements with 14 HARQ processes   R4-2214757: DraftCR - Test cases for NB-IoT DL 16-QAM demodulation performance   1. Added test case for DL 16-QAM demodulation performance HD-FDD NB-IoT UE in standalone mode. 2. Added test case for DL 16-QAM demodulation performance TDD NB-IoT UE in standalone mode. 3. Added new reference measurement channels for HD-FDD and TDD 16-QAM NPDSCH in standalone mode.   R4-2214809: draft CR: channel quality reporting requirements for NB-IoT   * Introduction of CQI reporting test for NB-IoT | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | UE features for Rel-17 eMTC and NB-IoT cannot be verified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.11.1.1, 8.11.1.1.3.1, 8.12.1.1, 8.12.1.1.5 (new), 8.12.1.2.4 (new), 9.14 (new), Table A.3.3.2.1-4, Table A.3.12.2.1-2, Table A.3.12.2.1-2a, Table A.4-1, Table A.4-22 (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS36.521-1 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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

## 8.11 Demodulation (UE supporting coverage enhancement)

The requirements for UE DL Category M1 in this sub-clause are defined based on the simulation results with UE DL Category M1 unless otherwise stated.

The requirements for UE DL Category M2 in this sub-clause are defined based on the simulation results with UE DL Category M2 unless otherwise stated.

The requirements of UE DL Category M1 in this sub-clause are applicable for UE DL Category M2, UE DL Category 1bis and Category 0, as specified in the applicability rule in the sub-clause 8.1.2.8A.

The requirements of UE DL Category M2 in this sub-clause are applicable for UE DL Category 1bis and Category 0, as specified in the applicability rule in the sub-clause 8.1.2.8A.

### 8.11.1 PDSCH

#### 8.11.1.1 FDD and half-duplex FDD (Fixed Reference Channel)

The parameters specified in Table 8.11.1.1-1 are valid for FDD and half-duplex FDD tests unless otherwise stated.

Table 8.11.1.1-1: Common Test Parameters (FDD and half-duplex FDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | CE Mode A | CE Mode B |
| Inter-TTI Distance |  | 1 | 1 |
| Number of HARQ processes per component carrier | Processes | 8 or 10 or 14  (Note 2) | 2 |
| Maximum number of HARQ transmission |  | 4 | 4 |
| Redundancy version coding sequence *rvidx* (Note 1) |  | {0, 2, 3, 1} for QPSK and 16QAM | {0,0,0,0,2,2,2,2,3,3,3,3,1,1,1,1…} for QPSK |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths,  2 for 10 MHz, 15 MHz and 20 MHz bandwidths | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths,  2 for 10 MHz, 15 MHz and 20 MHz bandwidths |
| Cyclic Prefix |  | Normal | Normal |
| Beamforming Precoder for MPDCCH |  | Annex B.4.4 | Annex B.4.4 |
| Precoder update granularity for MPDCCH |  | Frequency domain: 1 PRB  Time domain: identical during the hopping period (interval-FDD for CE Mode A) | Frequency domain: 1 PRB  Time domain: identical during the hopping period (interval-FDD for CE Mode B) |
| BL/CE DL subframe comfiguration (fdd-DownlinkOrTddSubframeBitmapBR) |  | 1111111111 | 1111111111 |
| HARQ bundling(ce-HARQ-AckBundling) |  | For test 7 in clause 8.11.1.1.3.1, enabled,otherwise, disabled | Disabled |
| Note 1: *rvidx* is defined in TS 36.213 [6] Table 7.1.7.1-2.  Note 2: For the tests except test 7 in clause 8.11.1.1.3.1, for UE supporting ce-pdsch-tenProcesses-r13, the number of HARQ processese are set to 10, otherwise, it is set to 8.For the test 7 in clause 8.11.1.1.3.1, the number of HARQ processes is set to 14. | | | |

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

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

8.11.1.1.3 Transmit diversity performance (Cell-Specific Reference Symbols)

8.11.1.1.3.1 Minimum Requirement 2 Tx Antenna Port supporting narrowband transmission

The requirements are specified in Table 8.11.1.1.3.1-2, with the addition of the parameters in Table 8.11.1.1.3.1-1 and Table 8.11.1.1.3.1-1a, and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

**Table 8.11.1.1.3.1-1: Test Parameters for Transmit diversity performance (FRC)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1 (Note 3)** | **Test 2 (Note 3)** | **Test 2a (Note 3)** | **Test 3 (Note 3)** | **Test 4 (Note 3)** |
| Downlink power allocation |  | dB | -3 | -3 | -3 | -3 | -3 |
|  | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| σ | dB | 0 | 0 | 0 | 0 | 0 |
| δ | dB | 3 | 3 | 3 | 3 | 3 |
| at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 | -98 |
| Coverage enhancement mode | |  | CE Mode B | CE Mode A | CE Mode A | CE Mode B | CE Mode B |
| PDSCH transmission mode | |  | 2 | 2 | 2 | 2 | 2 |
| OFDM starting symbol (startSymbolBR) | |  | 2 | 2 | 2 | 2 | 2 |
| Maximum number of repetitions  (for PDSCH (*pdsch-maxNumRepetitionCEmodeA/ pdsch-maxNumRepetitionCEmodeB*)) | |  | Not configured | Not configured | Not configured | Not configured | Not configured |
| PDSCH repetition number | |  | 64 | 1 | 1 | 32 | 16 |
| Frequency hopping  (mpdcch-pdsch-HoppingConfig) | |  | Enabled | Disabled | Disabled | Enabled | Enabled |
| Frequency hopping offset  (mpdcch-pdsch-HoppingOffset) | |  | 1 | N/A | N/A | 1 | 1 |
| Frequency hopping interval  (interval-FDD) | | ms | 16 | N/A | N/A | 8 | 4 |
| MPDCCH transmission duration  (mPDCCH-NumRepetition) | | ms | 64 | 1 | 1 | 32 | 8 |
| MPDCCH repetition number | |  | 64 | 1 | 1 | 32 | 8 |
| Number of narrowbands for frequency hopping  (mpdcch-pdsch-HoppingNB) | |  | 4 | N/A | N/A | 4 | 4 |
| Starting subframe configuration for MPDCCH  (mpdcch\_startSF\_UESS) | |  | 2.5 | 1 | 1 | 2.5 | 4 |
| Narrowband for MPDCCH  (mpdcch\_Narrowband) | |  | 7 | 0 | 0 | 7 | 7 |
| MPDCCH aggregation level | |  | 24 | 8 | 8 | 24 | 24 |
| CRS muting outside UE RF bandwidth (crs-IntfMitigEnabled) | |  | Disabled | Disabled | Enabled | Disabled | Disabled |
| Number of PRBs for CRS transmission (crs-IntfMitigNumPRBs) | |  | N/A | N/A | 6 | N/A | N/A |
| Note 1: .  Note 2: For each test, DC subcarrier puncturing shall be considered.  Note 3: Test 1, test 3 and test 4 are applicable for UE supporting CE Mode B. Test 2 is applicable for UE not supporting CE Mode B. Test 2a is applicable for UE not supporting CE Mode B and UE capable of ce-CRS-IntfMitig.  Note 4: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [4] or/and TS 36.213 [6] as appropriate. | | | | | | | |

**Table 8.11.1.1.3.1-1a: Test Parameters for Transmit diversity performance (FRC)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 5** | **Test 6** | **Test 7** |
| Downlink power allocation |  | dB | -3 | -3 | -3 |
|  | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| σ | dB | 0 | 0 | 0 |
| δ | dB | 3 | 3 | 3 |
| at antenna port | | dBm/15kHz | -98 | -98 | -98 |
| Coverage enhancement mode | |  | CE Mode A | CE Mode A | CE Mode A |
| PDSCH transmission mode | |  | 2 | 2 | 2 |
| OFDM starting symbol (startSymbolBR) | |  | 2 | 2 | 2 |
| Maximum number of repetitions  (for PDSCH (*pdsch-maxNumRepetitionCEmodeA/ pdsch-maxNumRepetitionCEmodeB*)) | |  | Not configured | Not configured | Not configured |
| PDSCH repetition number | |  | 1 | 1 | 1 |
| Frequency hopping  (mpdcch-pdsch-HoppingConfig) | |  | Disabled | Disabled | Disabled |
| Frequency hopping offset  (mpdcch-pdsch-HoppingOffset) | |  | N/A | N/A | N/A |
| Frequency hopping interval  (interval-FDD) | | ms | N/A | N/A | N/A |
| MPDCCH transmission duration  (mPDCCH-NumRepetition) | | ms | 4 | 1 | 1 |
| MPDCCH repetition number | |  | 4 | 1 | 1 |
| Number of narrowbands for frequency hopping  (mpdcch-pdsch-HoppingNB) | |  | N/A | N/A | N/A |
| Starting subframe configuration for MPDCCH  (mpdcch\_startSF\_UESS) | |  | 1 | 1 | 1 |
| Narrowband for MPDCCH  (mpdcch\_Narrowband) | |  | 0 | 0 | 0 |
| MPDCCH aggregation level | |  | 8 | 8 | 1 |
| CRS muting outside UE RF bandwidth (crs-IntfMitigEnabled) | |  | Disabled | Disabled | Disabled |
| Activation of 64QAM for non-repeated PDSCH in CE Mode A  (ce-PDSCH-64QAM-Config) | |  | Disabled | Enabled | Enabled |
| Note 1: .  Note 2: For each test, DC subcarrier puncturing shall be considered.  Note 3: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [4] or/and TS 36.213 [6] as appropriate.  Note 4: Test 6 is applicable for UE capable of ce-PDSCH-64QAM.  Note 5: Test 7 is applicable for UE capable of at least one of *ce-PDSCH-14HARQProcesses-r17* and ce-PDSCH-14HARQProcesses-Alt2-r17. Test 7 is applicable for UE in half-duplex FDD opreation | | | | | |

**Table 8.11.1.1.3.1-2: Minimum performance Transmit Diversity (FRC)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **Bandwidth and MCS** | **Reference Channel** | **OCNG Pattern** | **Propagation Condition** | **Correlation Matrix and Antenna Configuration** | **Reference value** | | **UE Category** |
| **Fraction of Maximum**  **Throughput (%)** | **SNR (dB)** |
| 1 | 10MHz QPSK 1/10 | R.81 FDD | OP.2 FDD | ETU1 | 2x1 Low | 70 | -13.5 | M1 |
| 2 | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | 9.4 | M1 |
| 2a | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | 9.6 | M1 |
| 3 | 10MHz QPSK 1/10 | R.81-1 FDD | OP.2 FDD | ETU1 | 2x2 Low | 70 | -13.3 | ≥1 |
| 4 | 10MHz QPSK 1/10 | R.81-2 FDD | OP.2 FDD | ETU1 | 2x4 Low | 70 | -13.3 | ≥1 |
| 5 | 10MHz QPSK 1/3 | R.103 FDD | OP.2 FDD | EPA200 | 2x1 Low | 70 | 3.8 | M1 |
| 6 | 10MHz 64QAM 0.4 | R.104 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | 12.9 | M1 |
| 7 | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | 9.4 | M1 |

8.11.1.1.3.2 Minimum Requirement 2 Tx Antenna Port supporting wideband transmission

The requirements are specified in Table 8.11.1.1.3.2-2, with the addition of the parameters in Table 8.11.1.1.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

**Table 8.11.1.1.3.2-1: Test Parameters for Transmit diversity performance (FRC)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | **Test 2** | **Test 2a (Note 4)** | **Test 3** | **Test 4** |
| Downlink power allocation |  | dB | -3 | -3 | -3 | -3 | -3 |
|  | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| σ | dB | 0 | 0 | 0 | 0 | 0 |
| δ | dB | 3 | 3 | 3 | 3 | 3 |
| at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 | -98 |
| Coverage enhancement mode | |  | CE Mode A | CE Mode B | CE Mode B | CE Mode A | CE Mode A |
| PDSCH transmission mode | |  | 2 | 2 | 2 | 2 | 2 |
| OFDM starting symbol (startSymbolBR) | |  | 2 | 2 | 2 | 2 | 2 |
| Maximum number of repetitions  for PDSCH (pdsch-maxNumRepetitionCEmodeA/ pdsch-maxNumRepetitionCEmodeB) | |  | Not configured | Not configured | Not configured | Not configured | Not configured |
| PDSCH repetition number | |  | 8 | 32 | 32 | 4 | 2 |
| Frequency hopping  (mpdcch-pdsch-HoppingConfig) | |  | Enabled | Enabled | Enabled | Disabled | Disabled |
| Frequency hopping offset  (mpdcch-pdsch-HoppingOffset) | |  | 5 | 5 | 5 | N/A | N/A |
| Frequency hopping interval  (interval-FDD) | | ms | 4 | 16 | 16 | N/A | N/A |
| Maximum number of MPDCCH repetitions  (mpdcch-NumRepetition) | |  | 16 | 64 | 64 | 8 | 2 |
| MPDCCH transmission duration | | ms | 16 | 64 | 64 | 8 | 2 |
| Number of narrowbands for frequency hopping  (mpdcch-pdsch-HoppingNB) | |  | 2 | 2 | 2 | N/A | N/A |
| Starting subframe configuration for MPDCCH  (mpdcch\_startSF\_UESS) | |  | 2 | 2 | 2 | 2.5 | 5 |
| Narrowband for MPDCCH  (mpdcch\_Narrowband) | |  | 0 | 0 | 0 | 0 | 0 |
| MPDCCH aggregation level | |  | 24 | 24 | 24 | 24 | 24 |
| CRS muting outside UE RF bandwidth (crs-IntfMitigEnabled) | |  | Disabled | Disabled | Enabled | Disabled | Disabled |
| Number of PRBs for CRS transmission (crs-IntfMitigNumPRBs) | |  | N/A | N/A | 24 | N/A | N/A |
| Note 1: .  Note 2: For each test, DC subcarrier puncturing shall be considered.  Note 3: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [4] or/and TS 36.213 [6] as appropriate.  Note 4: Test 2a is applicable for UE supporting CE Mode B and UE capable of ce-CRS-IntfMitig. | | | | | | | |

**Table 8.11.1.1.3.2-2: Minimum performance Transmit Diversity (FRC)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **Bandwidth and MCS** | **Reference Channel** | **OCNG Pattern** | **Propagation Condition** | **Correlation Matrix and Antenna Configuration** | **Reference value** | | **UE Category** |
| **Fraction of Maximum**  **Throughput (%)** | **SNR (dB)** |
| 1 | 10MHz QPSK 1/3 | R.90 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | -5.4 | M2 |
| 2 | 10MHz QPSK 1/10 | R.91 FDD | OP.2 FDD | ETU1 | 2x1 Low | 70 | -13.1 | M2 |
| 2a | 10MHz QPSK 1/10 | R.91 FDD | OP.2 FDD | ETU1 | 2x1 Low | 70 | -12.9 | M2 |
| 3 | 10MHz QPSK 1/2 | R.92-1 FDD | OP.2 FDD | EPA5 | 2x2 Low | 70 | -4.8 | ≥1 |
| 4 | 10MHz QPSK 1/2 | R.92-2 FDD | OP.2 FDD | EPA5 | 2x4 Low | 70 | -4.9 | ≥1 |

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

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

### 8.12.1 NPDSCH

#### 8.12.1.1 Half-duplex FDD

The parameters specified in Table 8.12.1.1-1 are valid for all half-duplex FDD tests unless otherwise stated.

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

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

##### 8.12.1.1.5 Minimum Requirements for Standalone for UE with 16-QAM

The requirements are specified in Table 8.12.1.1.5-2, with the addition of the parameters in Table 8.12.1.1.5-1 and the downlink physical channel setup according to Annex C.3.6. The purpose of these tests is to verify the NPDSCH performance with 16-QAM.

**Table 8.12.1.1.5-1: Test Parameters for 16-QAM NPDSCH under Standalone**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | | **Test 1** |
| at antenna port |  | dBm/15kHz | -93 (Note 1) |
|  | dBm/15kHz | -96 (Note 2) |
| NPDCCH repetition number | | subframe | 1 for Test 1 |
| (*npdcch-NumRepetitions-r13*) | | subframe | 4 for Test 1 |
| (*nPDCCH-startSF-USS-r13***)** | |  | 2 |
| Note 1: This noise is applied to all subframes from the end of the NPDCCH to the end of the following NPDSCH transmission;  Note 2: This noise is applied to all subframes from the end of the NPDSCH to the end of the following NPDCCH transmission. | | | |

**Table 8.12.1.1.5-2: Minimum performance for 16-QAM NPDSCH under Standalone with 1 NRS port**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **Bandwidth** | **Carrer Type** | **Reference Channel** | **Repetition number** | **Propagation condition** | **Number of NRS ports** | **Antenna Configuration** | **Reference value** | | **UE Category** |
| **Fraction of Maximum**  **Throughput (%)** | **SNR (dB)** |
| 1 | 200kHz | Non-anchor | R.NB.9 FDD | 1 | EPA5 | 1 | 1x1 | 70% | [19.5] | NB2 |

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

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

##### 8.12.1.2.4 Minimum Requirements for Standalone for UE with 16-QAM

The requirements are specified in Table 8.12.1.2.4-2, with the addition of the parameters in Table 8.12.1.2.4-1 and the downlink physical channel setup according to Annex C.3.6. The purpose of these tests is to verify the NPDSCH performance with 16-QAM.

**Table 8.12.1.2.4-1: Test Parameters for 16-QAM NPDSCH under Standalone**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | | **Test 1** |
| at antenna port |  | dBm/15kHz | -93 (Note 1) |
|  | dBm/15kHz | -96 (Note 2) |
| NPDCCH repetition number | | Subframe | 1 for Test 1 |
| (*npdcch-NumRepetitions-r13*) | | Subframe | 8 for Test 1 |
| (*nPDCCH-startSF-USS-r13***)** | |  | 4 |
| Note 1: This noise is applied to all subframes from the end of the NPDCCH to the end of the following NPDSCH transmission;  Note 2: This noise is applied to all subframes from the end of the NPDSCH to the end of the following NPDCCH transmission. | | | |

**Table 8.12.1.2.4-2: Minimum performance for 16-QAM NPDSCH under Standalone with 1 NRS port**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **Bandwidth** | **Carrer Type** | **Reference Channel** | **Repetition number** | **Propagation condition** | **Number of NRS ports** | **Antenna Configuration** | **Reference value** | | **UE Category** |
| **Fraction of Maximum**  **Throughput (%)** | **SNR (dB)** |
| 1 | 200kHz | Non-anchor | R.NB.8 TDD | 1 | EPA5 | 1 | 1x1 | 70% | [19.5] | NB2 |

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

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

## 9.14 CSI reporting of Narrowband IoT

The requirements in this sub-clause are defined based on the simulation results with UE DL Category NB2 unless otherwise stated.

### 9.14.1 CQI reporting definition under AWGN conditions

#### 9.14.1.1 Half-duplex FDD

The following requirements apply to UE Category NB2 capable of *npdsch-16QAM-r17*. For the parameters specified in Table 9.14.1.1-1, and using the downlink physical channels specified in C.3.6, the reported candidateRep value according to RC.33 FDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the NPDSCH BLER using the transport format indicated by median candidateRep value is less than or equal to 0.1, the BLER using the transport format indicated by the (median candidateRep value + 1) shall be greater than 0.1. If the NPDSCH BLER using the transport format indicated by the median candidateRep value is greater than 0.1, the BLER using transport format indicated by (median candidateRep value - 1) shall be less than or equal to 0.1.

Table 9.14.1.1-1: Half-duplex FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | |
| Bandwidth | kHz | 200 | |
| Operation mode |  | Stand-alone | |
| Carrier type |  | Non-anchor | |
| Number of NRS ports |  | 1 | |
| Propagation condition and antenna configuration |  | AWGN (1 x 1) | |
| SNR (Note 2) | dB | 10 | 11 |
|  | dB[mW/15kHz] | -88 | -87 |
|  | dB[mW/15kHz] | -98 | -98 |
| Max number of HARQ transmissions |  | 1 | |
| NPDCCH repetition number | subframe | 1 | |
| Rmax (npdcch-NumRepetitions-r13) | subframe | 4 | |
| G (nPDCCH-startSF-USS-r13) | subframe | 2 | |
| Scheduling delay field (IDelay) |  | 1 | |
| (ack-NACK-NumRepetitions-r13) |  | 1 | |
| ACK/NACK resource field |  | 0 | |
| NPDCCH reference channel |  | R.NB.3 FDD | |
| (npdcch-Offset-USS-r13) |  | 0 | |
| CQI reporting period | ms | 40 | |
| NPDSCH repetition number | subframe | 1 | |
| Resource assignment field (I­SF) (Note 4) |  | 3 | |
| downlinkBitmap-r13 and dl-Gap-r13 |  | Not configured | |
| dl-GapNonAnchor-r13 and downlinkBitmapNonAnchor-r13 |  | Not configured | |
| OCNG pattern |  | NB.OP.1 | |
| Note 1: Reference measurement channel RC.33 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern NB.OP.1 FDD as described in Annex A.5.3.1. For the subframes the reference measurement channel is not scheduled, NRS is transmitted with OCNG pattern NB.OP.1 FDD.  Note 2: The minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.  Note 3: MAC CE Downlink Channel Quality Report Command is triggered every 40 subframes, where NPDCCH scheduling MAC CE (NPDSCH) is transmitted in subframe *n*. UL grant is transmitted in subframe *n*+24.  Note 4: Set the number of subframes (NSF) for NPDSCH to 4 for NPDSCH transmitting MAC CE Downlink Channel Quality Report Command. | | | |

#### 9.14.1.2 TDD

The following requirements apply to UE Category NB2 capable of *npdsch-16QAM-r17*. For the parameters specified in Table 9.14.1.2-1, and using the downlink physical channels specified in C.3.6, the reported candidateRep value according to RC.33 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the NPDSCH BLER using the transport format indicated by median candidateRep value is less than or equal to 0.1, the BLER using the transport format indicated by the (median candidateRep value + 1) shall be greater than 0.1. If the NPDSCH BLER using the transport format indicated by the median candidateRep value is greater than 0.1, the BLER using transport format indicated by (median candidateRep value - 1) shall be less than or equal to 0.1.

Table 9.14.1.2-1: TDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | |
| Bandwidth | kHz | 200 | |
| Operation mode |  | Stand-alone | |
| Uplink downlink configuration (Note 4) |  | 4 | |
| Special subframe configuration (Note 5) |  | 4 | |
| Carrier type |  | Non-anchor | |
| Number of NRS ports |  | 1 | |
| Propagation condition and antenna configuration |  | AWGN (1 x 1) | |
| SNR (Note 2) | dB | 10 | 11 |
|  | dB[mW/15kHz] | -88 | -87 |
|  | dB[mW/15kHz] | -98 | -98 |
| Max number of HARQ transmissions |  | 1 | |
| NPDCCH repetition number | subframe | 1 | |
| Rmax (npdcch-NumRepetitions-r13) | subframe | 4 | |
| G (nPDCCH-startSF-USS-r13) | subframe | 2 | |
| Scheduling delay field (IDelay) |  | 1 | |
| (ack-NACK-NumRepetitions-r13) |  | 1 | |
| ACK/NACK resource field |  | 0 | |
| NPDCCH reference channel |  | R.NB.3 TDD | |
| (npdcch-Offset-USS-r13) |  | 0 | |
| CQI reporting period | ms | 80 | |
| NPDSCH repetition number | subframe | 1 | |
| Resource assignment field (I­SF) (Note 6) |  | 3 | |
| downlinkBitmap-r13 and dl-Gap-r13 |  | Not configured | |
| dl-GapNonAnchor-r13 and downlinkBitmapNonAnchor-r13 |  | Not configured | |
| OCNG pattern |  | NB.OP.1 | |
| Note 1: Reference measurement channel RC.33 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern NB.OP.1 TDD as described in Annex A.5.3.1. For the subframes the reference measurement channel is not scheduled, NRS is transmitted with OCNG pattern NB.OP.1 TDD.  Note 2: The minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.  Note 3: MAC CE Downlink Channel Quality Report Command is triggered every 80 subframes, where NPDCCH scheduling MAC CE (NPDSCH) is transmitted in subframe *n*. UL grant is transmitted in subframe *n*+40.  Note 4: As specified in Table 4.2-2 in TS 36.211 [4].  Note 5: As specified in Table 4.2-1 in TS 36.211 [4].  Note 6: Set the number of subframes (NSF) for NPDSCH to 4 for NPDSCH transmitting MAC CE Downlink Channel Quality Report Command. | | | |

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

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

## A.3.3 Reference measurement channels for PDSCH performance requirements (FDD)

### A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

#### A.3.3.2.1 Two antenna ports

**Table A.3.3.2.1-4: Fixed Reference Channel two antenna ports**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Values** | | |
| Reference channel |  | R.79 FDD | R.103 FDD | R.104 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 3 | 3 | 3 |
| Allocated DL subframes per Radio Frame |  | Note 3 | Note 5 | Note 3  Note 6 |
| Modulation |  | 16QAM | QPSK | 64QAM |
| Target Coding Rate |  | 1/2 | 1/3 | 0.4 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 744 | 224 | 968 |
| Number of Code Blocks |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 | 1 | 1 |
| Binary Channel Bits |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1584 | 792 | 2376 |
| Max. Throughput averaged over 1 frame | Mbps | 0.149 | 0.0187 | 0.194 |
| UE DL Category |  | M1, M2 ≥ 0 | M1, M2 | M1, M2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: The downlink subframes are scheduled at the 0th and 1st subframes every 10ms. Information bit payload is available if downlink subframe is scheduled (starting from 0th subframe). The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmissions.  Note 4: Allocated PRB positions for PDSCH are {3, 4, 5} within the assigned narrowband. Allocated PRB positions for MPDCCH are {0, 1} within the assigned narrowband.  Note 5: The downlink subframes are scheduled at the 0th subframes every 12ms. Information bit payload is available if downlink subframe is scheduled (starting from 5th subframe). The corresponding MPDCCH is scheduled 5 subframes before the corresponding PDSCH transmissions.  Note 6: For case with 14 HARQ processes, scheduling pattern is 17ms. In every scheduling period, subframes from 0 to 11 are used for MPDCCH and MPDSCH transmission, the corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmissions which are scheduled in subframes from 2 to 11. The corresponding MPDCCH is scheduled 7 subframes before the corresponding PDSCH transmissions which are scheduled in subframes 0 and 1. Subframe 13 is used for ACK/NACK feedback corresponding to MPDSCH transmitted in subframe from 0 to 3; Subframe 14 is used for ACK/NACK feedback corresponding to MPDSCH transmitted in subframe from 4 to 7; Subframe 15 is used for ACK/NACK feedback corresponding to MPDSCH transmitted in subframe from 8 to 11. Subframes 12 and 16 are used for gaps. | | | | |

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

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

**Table A.3.12.2.1-2: NPDSCH Reference Channel with 1Tx Antenna for UE Category NB2 for FDD**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Value** | **Value** |
| Reference channel |  | R.NB.7 FDD | R.NB.8 FDD | R.NB.9 FDD |
| Carrier Type |  | Non-anchor | Non-anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 | 200 |
| Allocated subframes per Radio Frame |  | Note 1 | Note 1 | Note 1 |
| Modulation |  | QPSK | QPSK | 16-QAM |
| ITBS/ISF |  | 9/5 | 6/7 | 21/7 |
| Target Coding Rate |  | ½ | 1/3 | 3/4 |
| Coding Rate |  | 0.5 | 0.32 | 0.78 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 936 | 1032 | 4968 |
| For Sub-Frame 0,5 | Bits | 936 | 1032 | 4968 |
| For Sub-Frame 4,9 | Bits | 936 | 1032 | 4968 |
| Number of Code Blocks |  |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 |  | 1 | 1 | 1 |
| For Sub-Frame 0,5 | Bits | 1 | 1 | 1 |
| For Sub-Frame 4,9 | Bits | 1 | 1 | 1 |
| Binary Channel Bits |  |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 320 | 320 | 640 |
| For Sub-Frame 0,5 | Bits | 320 | 320 | 640 |
| For Sub-Frame 4,9 | Bits | 320 | 320 | 640 |
| Max. Average Throughput | Bps | Note 2 | Note 2 | Note 2 |
| UE Category |  | NB2 | NB2 | NB2 |
| Note 1: It shall depend on the specific NPDSCH scheduling.  Note 2: Maximum Average Throughput equals to sum of TB(i) divided by sum of T(i), where TB(i) is the TB size of NPDSCH over ith NPDSCH scheduling period, and T(i) is the total time consisting of NPDCCH transmission duration, NPDCCH to NPDSCH scheduling delay,  NPDSCH transmission duration, NPDSCH to NPUSCH format 2 scheduling delay, NPUSCH format 2 transmission duration, possible delay between NPUSCH format 2 and NPDCCH for next NPDSCH scheduling and subframes used for NPSS/NSSS/NPBCH/NB-SIB1/NB-SIB2 transmission during the ith NPDSCH scheduling period. | | | | |

**Table A.3.12.2.1-2a: NPDSCH Reference Channel with 1Tx Antenna for UE Category NB2 for TDD**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Value** |
| Reference channel |  | R.NB.7 TDD | R.NB.8 TDD |
| Carrier Type |  | Non-anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 |
| Uplink-Downlink Configuration (Note 7) |  | 4 | 4 |
| Allocated subframes per Radio Frame |  | Note 1 | Note 1 |
| Modulation |  | QPSK | 16-QAM |
| ITBS/ISF |  | 9/5 | 21/7 |
| Target Coding Rate |  | 1/2 | 3/4 |
| Coding Rate |  | 0.5 | 0.78 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 1,6,7,8 | Bits | 936 | 4968 |
| For Sub-Frame 0,5 | Bits | Note 2 | Note 2 |
| For Sub-Frame 4,9 | Bits | 936 | 4968 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 |  | 1 | 1 |
| For Sub-Frame 0,5 | Bits | Note 3 | Note 3 |
| For Sub-Frame 4,9 | Bits | 1 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 320 | 640 |
| For Sub-Frame 0,5 | Bits | Note 4 | Note 4 |
| For Sub-Frame 4,9 | Bits | 320 | 640 |
| Max. Average Throughput | Bps | Note 5 | Note 5 |
| UE Category |  | NB2 | NB2 |
| Note 1: It shall depend on the specific NPDSCH scheduling.  Note 2: N/A when mod 2 = 0, otherwise 936 for R.NB.7 TDD and 4968 for R.NB.8 TDD.  Note 3: N/A when mod 2 = 0, otherwise 1.  Note 4: N/A when mod 2 = 0, otherwise 320 for R.NB.7 TDD and 640 for R.NB.8 TDD.  Note 5: Maximum Average Throughput equals to sum of TB(i) divided by sum of T(i), where TB(i) is the TB size of NPDSCH over ith NPDSCH scheduling period, and T(i) is the total time consisting of NPDCCH transmission duration, NPDCCH to NPDSCH scheduling delay,  NPDSCH transmission duration, NPDSCH to NPUSCH format 2 scheduling delay, NPUSCH format 2 transmission duration, possible delay between NPUSCH format 2 and NPDCCH for next NPDSCH scheduling and subframes used for NPSS/NSSS/NPBCH/NB-SIB1/NB-SIB2 transmission during the ith NPDSCH scheduling period. | | | |

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

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

# A.4 CSI reference measurement channels

This section defines the DL signal applicable to the reporting of channel status information (Clause 9.2, 9.3 and 9.5).

In Table A.4-1 are specified the reference channels. Table A.4-13 specifies the mapping of CQI index to modulation coding scheme, which complies with the CQI definition specified in Section 7.2.3 of [6].

Table A.4-0: Void

Table A.4-1: CSI reference measurement channels

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RMC Name | Duplex | | CH-BW | | Alloc. RB-s | | UL/DL Config | | Alloc. SF-s | | | MCS Scheme | | Nr. HARQ Proc. | | Max. nr HARQ Trans. | | Notes |
| 1 CRS Port | | | | | | | | | | | | | | | | | | |
| RC.1 FDD | FDD | | 10 | | 50 | | - | |  | | | MCS.1 | | 8 | | 1 | |  |
| RC.1A FDD | FDD | | 10 | | 50 | |  | |  | | | MCS.1A | | 8 | | 1 | |  |
| RC.1 TDD | TDD | | 10 | | 50 | | Note 3 | |  | | | MCS.1 | | 10 | | 1 | |  |
| RC.1A TDD | TDD | | 20 | | 100 | | Note 3 | |  | | | MCS.1B | | 10 | | 1 | |  |
| RC.3 FDD | FDD | | 10 | | 6 | | - | |  | | | MCS.10 | | 8 | | 1 | |  |
| RC.3 TDD | TDD | | 10 | | 6 | | Note 3 | |  | | | MCS.10 | | 10 or 7 (Note 9) | | 1 | |  |
| RC.4 FDD | FDD | | 10 | | 15 | | - | |  | | | MCS.15 | | 8 | | 1 | | Note 6 |
| RC.4 TDD | TDD | | 10 | | 15 | | Note 3 | |  | | | MCS.15 | | 10 | | 1 | | Note 6 |
| RC.5 FDD | FDD | | 10 | | 3 | | - | |  | | | MCS.17 | | 8 | | 1 | |  |
| RC.5 TDD | TDD | | 10 | | 3 | | Note 3 | |  | | | MCS.17 | | 10 | | 1 | |  |
| RC.14 FDD | FDD | | 5 | | 25 | | - | |  | | | MCS.14 | | 8 | | 1 | |  |
| RC.15 FDD | FDD | | 5 | | 15 | | - | |  | | | MCS.15 | | 8 | | 1 | | Note 6 |
| RC.16 FDD | FDD/HD-FDD | | 10 | | 2 | |  | |  | | | MCS.20 | | 8 | | 1 | | Note 8,10 |
| RC.16 TDD | TDD | | 10 | | 2 | | Note 3 | |  | | | MCS.20 | | 10 | | 1 | | Note 8 |
| RC.23FDD | FDD/HD-FDD | | 10 | | 3 | |  | |  | | | MCS.28 | | 8 | | 1 | | Note 12, 13 |
| RC.23 TDD | TDD | | 10 | | 3 | |  | |  | | | MCS.28 | | 10 | | 1 | | Note 12 |
| RC.25 FDD | FDD/HD-FDD | | 10 | | 3 | |  | |  | | | MCS.28 | | 8 | | 1 | | Note 14, 20 |
| RC.25 TDD | TDD | | 10 | | 3 | |  | |  | | | MCS.28 | | 10 | | 1 | | Note 12, 15 |
| RC.31 FDD | FDD/HD-FDD | | 10 | | 3 | |  | |  | | | MCS.40 | | 8 | | 1 | | Note 12, 13 |
| RC.31 TDD | TDD | | 10 | | 3 | |  | |  | | | MCS.40 | | 10 | | 1 | | Note 12 |
| RC.32 FDD | FDD/HD-FDD | | 10 | | 3 | |  | |  | | | MCS.41 | | 8 | | 1 | | Note 12, 13 |
| RC.32 TDD | TDD | | 10 | | 3 | |  | |  | | | MCS.41 | | 10 | | 1 | | Note 12 |
| RC.30 FDD | FDD | | 10 | | 50 | |  | |  | | | MCS.38 | | 8 | | 1 | |  |
| RC.30 TDD | TDD | | 20 | | 100 | |  | |  | | | MCS.39 | | 10 | | 1 | |  |
| 2 CRS Ports | | | | | | | | | | | | | | | | | | |
| RC.2 FDD | FDD | | 10 | | 50 | | - | |  | | | MCS.2 | | 8 | | 1 | |  |
| RC.2A FDD | FDD | | 20 | | 100 | |  | |  | | | MCS.2A | | 8 | | 1 | |  |
| RC.2 TDD | TDD | | 10 | | 50 | | Note 3 | |  | | | MCS.2 | | 10 or 7 (Note 9) | | 1 | |  |
| RC.4A FDD | FDD | | 20 | | 15 | | - | |  | | | MCS.16 | | 8 | | 1 | | Note 6 |
| RC.6 FDD | FDD | | 10 | | 15 | | - | |  | | | MCS.16 | | 8 | | 1 | | Note 6 |
| RC.6 TDD | TDD | | 10 | | 15 | | Note 3 | |  | | | MCS.16 | | 7 | | 1 | | Note 6 |
| 4 CRS Ports | | | | | | | | | | | | | | | | | | |
| RC.17 FDD | FDD | | 10 | | 50 | | - | |  | | | MCS.18 | | 8 | | 1 | |  |
| RC.17 TDD | TDD | | 10 | | 50 | | Note 3 | |  | | | MCS.18 | | 7 | | 1 | |  |
| RC.21 FDD | FDD | | 10 | | 50 | | - | |  | | | MCS.26 | | 8 | | 1 | |  |
| RC.21 TDD | TDD | | 10 | | 50 | | Note 3 | |  | | | MCS.26 | | 7 | | 1 | |  |
| 1 CRS Port + CSI-RS | | | | | | | | | | | | | | | | | | |
| RC.8 FDD | FDD | | 10 | | 6 | | - | | Non CSI-RS | | | MCS.11 | | 8 | | 1 | |  |
| 2 CSI-RS | | | MCS.12 | |
| RC.8A FDD | FDD | | 10 | | 6 | | - | | Non CSI-RS | | | MCS.11A | | 8 | | 1 | |  |
| 2 CSI-RS | | | MCS.12A | |
| RC.8 TDD | TDD | | 10 | | 6 | | Note 3 | | Non CSI-RS | | | MCS.11 | | 10 | | 1 | |  |
| 2 CSI-RS | | | MCS.12 | |
| RC.8A TDD | TDD | | 20 | | 8 | | Note 3 | | Non CSI-RS | | | MCS.11B | | 10 | | 1 | |  |
| 2 CSI-RS | | | MCS.12B | |
| RC.9 FDD | FDD | | 10 | | 50 | | - | | Non CSI-RS | | | MCS.3 | | 8 | | 1 | |  |
| 2 CSI-RS | | | MCS.4 | |
| RC.9A FDD | FDD | | 20 | | 100 | | - | | Non  CSI-RS | | | MCS.3A | | 8 | | 1 | |  |
| 2 CSI-RS | | | MCS.4A | |
| RC.9B FDD | FDD | | 10 | | 50 | | - | | Non CSI-RS, rank 1/2 | | | MCS.3 | | 8 | | 1 | |  |
| Non CSI-RS, rank 3/4 | | | MCS.30 | |
| 4 CSI-RS, rank 1/2 | | | MCS.29 | |
| 4 CSI-RS, rank 3/4 | | | MCS.31 | |
| RC.9 TDD | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS | | | MCS.3 | | 7 | | 1 | |  |
| 2 CSI-RS | | | MCS.4 | |
| RC.9B TDD | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS, rank 1/2 | | | MCS.3 | | 7 | | 1 | |  |
| Non CSI-RS, rank 3/4 | | | MCS.30 | |
| 4 CSI-RS, rank 1/2 | | | MCS.29 | |
| 4 CSI-RS, rank 3/4 | | | MCS.31 | |
| 2 CRS Port + CSI-RS | | | | | | | | | | | | | | | | | | |
| RC.7 FDD | FDD | | 10 | | 50 | | - | | Non CSI-RS | | | MCS.5 | | 8 | | 1 | |  |
| 4 CSI-RS | | | MCS.7 | |
| RC.7 TDD | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS | | | MCS.5 | | 10 | | 1 | |  |
| 8 CSI-RS | | | MCS.8 | |
| RC.11 FDD | FDD | | 10 | | 50 | | - | | Non CSI-RS | | | MCS.5 | | 8 | | 1 | |  |
| 2 CSI-RS | | | MCS.6 | |
| RC.11 TDD | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS | | | MCS.5 | | 10 | | 1 | |  |
| 2 CSI-RS | | | MCS.6 | |
| RC.18 FDD | FDD | | 10 | | 6 | | - | | Non CSI-RS | | | MCS.13 | | 8 | | 1 | |  |
| 4 CSI-RS | | | MCS.19 | |
| RC.18 TDD | TDD | | 10 | | 6 | | Note 3 | | Non CSI-RS | | | MCS.13 | | 7 | | 1 | |  |
| 4 CSI-RS | | | MCS.19 | |
| RC.17 TDD | TDD | | 10 | | 6 | | Note 3 | | 4 ZP-CSI-RS | | | MCS.21 | | 10 | | 1 | |  |
| RC.18 TDD | TDD | | 10 | | 6 | | Note 3 | | 4 ZP-CSI-RS | | | MCS.22 | | 10 | | 1 | |  |
| RC.19 TDD | TDD | | 10 | | 41 | | Note3 | | 4 ZP-CSI-RS | | | MCS.23 | | 10 | | 1 | | Note 11 |
| RC.20 TDD | TDD | | 10 | | 50 | | Note3 | | Non CSI-RS | | | MCS.24 | | 10 | | 1 | |  |
| 2 CSI-RS,  4 ZP-CSI-RS | | | MCS.25 | |
| RC.22 FDD | FDD | | 10 | | 50 | | - | | Non CSI-RS | | | MCS.5 | | 8 | | 1 | |  |
| 4 CSI-RS | | | MCS.27 | |
| RC.22 TDD | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS | | | MCS.5 | | 10 | | 1 | |  |
| 4 CSI-RS | | | MCS.27 | |
| RC.23 TDD | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS | | | MCS.9 | | 10 | | 1 | | Rank 4 |
| 4 CSI-RS | | | MCS.32 | |
| 1 CRS Port + CSI-RS + CSI-IM | | | | | | | | | | | | | | | | | | |
| RC.13 FDD | | FDD | | 10 | | 50 | | - | | Non CSI-RS/IM | MCS.3 | | 8 | | 1 | |  | |
| CSI-RS/IM | N/A | |
| RC.13 TDD | | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS/IM | MCS.3 | | 10 | | 1 | |  | |
| CSI-RS/IM | N/A | |
| 2 CRS Port + CSI-RS + CSI-IM | | | | | | | | | | | | | | | | | | |
| RC.10 FDD | | FDD | | 10 | | 50 | | - | | Non CSI-RS | MCS.5 | | 8 | | 1 | |  | |
| 4 CSI-RS,  1 CSI process | MCS.8 | |
| RC.10 TDD | | TDD | | 10 | | 50 | | Note 3 | | Non CSI-RS | MCS.5 | | 10 | | 1 | |  | |
| 8 CSI-RS, 1 CSI process | MCS.9 | |
| RC.12 FDD | | FDD | | 10 | | 6 | | - | | Non CSI-RS/IM | MCS.13 | | 8 | | 1 | |  | |
| CSI-RS/IM | N/A | |
| RC.12 TDD | | TDD | | 10 | | 6 | | Note 3 | | Non CSI-RS/IM | MCS.13 | | 10 | | 1 | |  | |
| CSI-RS/IM | N/A | |
| Short TTI | | | | | | | | | | | | | | | | | | |
| RC.26 FDD | | FDD | | 10 | | 50 | | - | | - | MCS.32-1  MCS.32-2 | | 8 | | 1 | | Note 2 | |
| RC.27 FDD | | FDD | | 10 | | 50 | | - | | Non CSI-RS | MCS.33-1  MCS.33-2 | | 8 | | 1 | | Note 2 | |
| FDD | | 10 | | 50 | | - | | 2 CSI-RS | MCS.34-1  MCS.34-2 | | 8 | | 1 | | Note 2 | |
| RC.28 FDD | | FDD | | 10 | | 50 | | - | | - | MCS.35-1  MCS.35-2  MCS.35-3  MCS.35-4  MCS.35-5 | | 16 | | 1 | | Note 2  Note 17  Note 18 | |
| RC.29 FDD | | FDD | | 10 | | 50 | | - | | Non CSI-RS | MCS.36-1  MCS.36-2  MCS.36-3  MCS.36-4  MCS.36-5 | | 16 | | 1 | | Note 2  Note 17  Note 19 | |
| FDD | | 10 | | 50 | | - | | 2 CSI-RS | MCS.37-1  MCS.37-2  MCS.37-3  MCS.37-4  MCS.37-5 | | 16 | | 1 | | Note 2  Note 17  Note 19 | |
| RC.26 TDD | | TDD | | 10 | | 50 | | - | | - | MCS.32-1  MCS.32-2 | | 10 | | 1 | | Note 5 | |
| RC.27 TDD | | TDD | | 10 | | 50 | | - | | Non CSI-RS | MCS.33-1  MCS.33-2 | | 16 | | 1 | | Note 5 | |
| TDD | | 10 | | 50 | | - | | 2 CSI-RS | MCS.34-1  MCS.34-2 | | 16 | | 1 | | Note 5 | |
| **Narrowband IoT** | | | | | | | | | | | | | | | | | | |
| RC.33 FDD | | HD-FDD | | 200kHz | | 1 | | - | | - | MCS.42 | | 1 | | 1 | |  | |
| RC.33 TDD | | TDD | | 200kHz | | 1 | | Note 3 | | - | MCS.42 | | 1 | | 1 | |  | |
| Note 1: 3 symbols allocated to PDCCH.  Note 2: For FDD only subframes 1, 2, 3, 4, 6, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.  Note 3: TDD UL-DL configuration as specified in the individual tests.  Note 4: For TDD when UL-DL configuration 1 is used only subframes 4 and 9 are allocated to avoide PBCH and synchronizaiton signal overhead.  Note 5: For TDD when UL-DL configuration 2 is used only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead.  Note 6: Centered within the Transmission Bandwidth Configuration (Figure 5.6-1).  Note 7: Only subframes 2, 3, 4, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.  Note 8: Allocate PDSCH on 5th and 6th PRBs within a subband.  Note 9: The number of HARQ processes is 10 for TDD UL/DL configuration 2 and 7 for TDD UL/DL configuration 1.  Note 10: The downlink subframes are scheduled at the 1st, 2nd, 8th, 9th, 16th, 17th, 18th, 24th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.(starting from 0th subframe)  Note 11: 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in subframe 0 and 5 in RC.19 TDD.  Note 12: Allocate PDSCH on 3th, 4th and 5th PRBs within a narrowband. Allocate MPDCCH on the 0th and 1st PRBs within a narrowband.  Note 13: The PDSCH subframes are scheduled at the 0th and 1st subframes every 10ms. Information bit payload is available if downlink subframe is scheduled (starting from 0th subframe). MPDCCH subframes are scheduled at the 8th and 9th subframes every 10ms.  Note 14: The downlink subframes are scheduled at the 0th to 4th subframes every 20ms. Information bit payload is scheduled at the 4th subframe (starting from 0th subframe). MPDCCH and Information bit payload are not scheduled in the radio frames where systemInformation1-BR is scheduled and  = 4 with the set of frames and subframes for SIB1-BR defined in TS 36.211 [16] Table 6.4.1-2.  Note 15: Information bit payload is scheduled at the 8th subframe every 20ms (starting from 0th subframe).  Note 16: 2 symbols allocated for PDCCH.  Note 17: No PDSCH is scheduled in subslot index 0.  Note 18: Subslot-PDSCH is scheduled in subslots 2, 3, and 4.  Note 19: Subslot-PDSCH is scheduled in subslots 1 and 5.  Note 20: Allocate PDSCH on 3th, 4th and 5th PRBs within a narrowband. Allocate MPDCCH on the 0th, 1st, 2nd and 3rd PRBs within a narrowband. | | | | | | | | | | | | | | | | | | |

Table A.4-1a: Void

Table A.4-1b: Void

Table A.4-1c: Void

Table A.4-1d: Void

Table A.4-1e: Void

Table A.4-2: Void

Table A.4-2a: Void

Table A.4-2b: Void

Table A.4-2c: Void

Table A.4-2d: Void

Table A.4-2e: Void

Table A.4-3: Void

Table A.4-3a: Void

Table A.4-3b: Void

Table A.4-3c: Void

Table A.4-3d: Void

Table A.4-3e: Void

Table A.4-3f: Void

Table A.4-3g: Void

Table A.4-3h: Void

Table A.4-3i: Void

**Table A.4-3j: Void**

**Table A.4-3k: Void**

Table A.4-3l: Void

Table A.4-3m: Void

Table A.4-4: Void

Table A.4-4a: Void

Table A.4-4b: Void

Table A.4-5: Void

Table A.4-5a: Void

Table A.4-5b: Void

Table A.4-6: Void

Table A.4-6a: Void

Table A.4-6b: Void

Table A.4-6c: Void

Table A.4-6d: Void

Table A.4-6e: Void

Table A.4-6f: Void

Table A.4-7: Void

Table A.4-8: Void

Table A.4-9: Void

Table A.4-10: Void

Table A.4-11: Void

Table A.4-12: Void

**Table A.4-13: Mapping of CQI Index to Modulation coding scheme (MCS)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Coding Rate | | | | OOR | 0.0762 | 0.1172 | 0.1885 | 0.3008 | 0.4385 | 0.5879 | 0.3691 | 0.4785 | 0.6016 | 0.4551 | 0.5537 | 0.6504 | 0.7539 | 0.8525 | 0.9258 |
| Modulation | | | | OOR | QPSK | | | | | | 16QAM | | | 64QAM | | | | | |
| MCS Scheme | | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.1 | | 50 | 6300 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 25 | 27 | 27 |  |
| MCS.2 | | 50 | 6000 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 |  |
| MCS.2A | | 100 | 12000 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 |  |
| MCS.3 | | 50 | 5700 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 10 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 26 |  |
| MCS.3A | | 100 | 11400 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 26 |  |
| MCS.4 | | 50 | 5600 | DTX | 0 | 0 | 2 | 4 | 6 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 |  |
| MCS.4A | | 100 | 11200 | DTX | 0 | 0 | 2 | 4 | 6 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 |  |
| MCS.5 | | 50 | 5400 | DTX | 0 | 0 | 2 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 24 | 25 |  |
| MCS.6 | | 50 | 5300 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 22 | 24 | 25 |  |
| MCS.7 | | 50 | 5200 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 18 | 20 | 22 | 24 | 25 |  |
| MCS.8 | | 50 | 5000 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 13 | 17 | 18 | 20 | 22 | 23 | 24 |  |
| MCS.9 | | 50 | 4800 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 13 | 17 | 18 | 20 | 22 | 23 | 24 |  |
| MCS.10 | | 6 | 756 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 19 | 21 | 23 | 25 | 27 | 27 |  |
| MCS.11 | | 6 | 684 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 14 | 17 | 20 | 21 | 23 | 25 | 27 |  |
| MCS.12 | | 6 | 672 | DTX | 0 | 0 | 1 | 4 | 6 | 8 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 |  |
| MCS.13 | | 6 | 648 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 22 | 24 | 25 |  |
| MCS.14 | | 25 | 3150 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 25 | 27 | 27 |  |
| MCS.15 | | 15 | 1890 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 25 | 27 | 27 |  |
| MCS.16 | | 15 | 1800 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 |  |
| MCS.17 | | 3 | 378 | DTX | 0 | 1 | 2 | 5 | 7 | 9 | 12 | 13 | 16 | 19 | 21 | 23 | 25 | 27 | 27 |  |
| MCS.18 | | 50 | 5800 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 20 | 22 | 23 | 26 | 27 |  |
| MCS.19 | | 6 | 624 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 18 | 20 | 22 | 24 | 25 |  |
| MCS.20 | | 2 | 252 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 19 | 21 | 23 | 23 | 23 | 23 |  |
| MCS.21 | | 6 | 696 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 21 | 24 | 25 | 27 |  |
| MCS.22 | | 6 | 624 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 20 | 22 | 24 | 24 |  |
| MCS.23 | | 41 | 4264 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 18 | 20 | 22 | 24 | 24 |  |
| MCS.24 | | 50 | 5400 | DTX | 0 | 0 | 2 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 21 | 23 | 24 | 25 |  |
| MCS.25 | | 50 | 5100 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 8 | 12 | 13 | 15 | 18 | 20 | 22 | 23 | 24 |  |
| MCS 26 | | 50 | 5800 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 |  |
| MCS.27 | CW0 | 50 | 4600 | DTX | 0 | 0 | 1 | 3 | 5 | 6 | 10 | 11 | 13 | 17 | 18 | 19 | 21 | 23 | 23 |  |
| CW1 | 50 | 4600 | DTX | 0 | 0 | 1 | 3 | 5 | 6 | 10 | 11 | 13 | 17 | 18 | 19 | 21 | 22 | 23 |  |
| MCS 29 | | 50 | 5500 | DTX | 0 | 0 | 2 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 21 | 23 | 24 | 25 |  |
| MCS.30 | | 50 | 10200 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 8 | 12 | 14 | 15 | 18 | 20 | 22 | 23 | 24 |  |
| MCS.31 | | 50 | 9800 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 8 | 11 | 13 | 14 | 18 | 20 | 21 | 23 | 23 |  |
| MCS.32 | | 50 | 4600 | DTX | 0 | 0 | 1 | 3 | 5 | 6 | 10 | 11 | 13 | 17 | 18 | 19 | 21 | 22 | 23 | 2Layer1CW |
| Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].  Note 2: 3 symbols allocated to PDCCH.  Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement except for [MCS.23]. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | | |

Table A.4-14: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Spectral Efficiency | | | OOR | 0.1523 | 0.3770 | 0.8770 | 1.4766 | 1.9141 | 2.4063 | 2.7305 | 3.3223 | 3.9023 | 4.5234 | 5.1152 | 5.5547 | 6.2266 | 6.9141 | 7.4063 |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.1A | 50 | 6300 | DTX | 0 | 1 | 3 | 5 | 7 | 10 | 11 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 26 |  |
| MCS.1B | 100 | 12600 | DTX | 0 | 1 | 3 | 5 | 7 | 10 | 11 | 14 | 15 | 18 | 20 | 22 | 24 | 26 | 26 |  |
| Note 1: Mapping between Imcs and CQI Index according to Tables 7.1.7.1-1A, 7.1.7.2.1-1 and 7.2.3-2 in TS 36.213 [6].  Note 2: 3 symbols allocated to PDCCH.  Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | |

Table A.4-15: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Spectral Efficiency | | | OOR | 0.1523 | 0.3770 | 0.8770 | 1.4766 | 1.9141 | 2.4063 | 2.7305 | 3.3223 | 3.9023 | 4.5234 | 5.1152 | 5.5547 | 6.2266 | 6.9141 | 7.4063 |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.11A | 6 | 684 | DTX | 0 | 1 | 3 | 5 | 7 | 8 | 10 | 13 | 14 | 16 | 18 | 20 | 22 | 24 | 25 |  |
| MCS.12A | 6 | 672 | DTX | 0 | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 25 |  |
| MCS.11B | 8 | 912 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 10 | 13 | 14 | 16 | 18 | 19 | 22 | 24 | 26 |  |
| MCS.12B | 8 | 896 | DTX | 0 | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 19 | 22 | 24 | 25 |  |
| Note 1: Mapping between Imcs and CQI Index according to Tables 7.1.7.1-1A, 7.1.7.2.1-1 and 7.2.3-2 in TS 36.213 [6].  Note 2: 3 symbols allocated to PDCCH.  Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | |

Table A.4-16: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS indx Table 3)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Coding Rate | | | OOR | 0.0391 | 0.0762 | 0.1172 | 0.1885 | 0.3008 | 0.4385 | 0.5879 | 0.3691 | 0.4785 | 0.6015 | Reserved | Reserved | Reserved | Reserved | Reserved |
| Modulation | | | OOR | QPSK | | | | | | | 16QAM | | |  | | | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.28 | 3 | 378 | DTX | 0 | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | N/A | N/A | N/A | N/A | N/A |  |
| Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].  Note 2: startSymbolBR = 3 | | | | | | | | | | | | | | | | | | | |

Table A.4-17: Mapping of CQI Index to Modulation coding scheme (Slot-PDSCH)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Spectral Efficiency | | | | OOR | 0.1523 | 0.2344 | 0.3770 | 0.6016 | 0.8770 | 1.1758 | 1.4766 | 1.9141 | 2.4063 | 2.7305 | 3.3223 | 3.9023 | 4.5234 | 5.1152 | 5.5547 |
| MCS Scheme | PRB | Available RE-s | Slot number | Imcs | | | | | | | | | | | | | | | |
| MCS.32-1 | 50 | 2800 | 0 | DTX | 0 | 0 | 2 | 4 | 6 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 | Slot 0 |
| MCS.32-2 | 50 | 3672 | 1 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 13 | 15 | 16 | 20 | 23 | 25 | 27 | 28 | 28 | Slot 1 |
| MCS.33-1 | 50 | 2600 | 0 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 18 | 20 | 22 | 24 | 25 | Slot 0 |
| MCS.33-2 | 50 | 3348 | 1 | DTX | 0 | 0 | 2 | 4 | 7 | 9 | 12 | 14 | 16 | 19 | 21 | 23 | 26 | 27 | 28 | Slot 1 |
| MCS.34-1 | 50 | 2500 | 0 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 13 | 17 | 18 | 20 | 22 | 23 | 24 | Slot 0 |
| MCS.34-2 | 50 | 3348 | 1 | DTX | 0 | 0 | 2 | 4 | 7 | 9 | 12 | 14 | 16 | 19 | 21 | 23 | 26 | 27 | 28 | Slot 1 |
| Note 1: Mapping between Imcs and CQI Index according to Tables 7.1.7.1-1 in TS 36.213 [6].  Note 2: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | | |

Table A.4-18: Mapping of CQI Index to Modulation coding scheme (Subslot-PDSCH)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Spectral Efficiency | | | | OOR | 0.1523 | 0.2344 | 0.3770 | 0.6016 | 0.8770 | 1.1758 | 1.4766 | 1.9141 | 2.4063 | 2.7305 | 3.3223 | 3.9023 | 4.5234 | 5.1152 | 5.5547 |
| MCS Scheme | PRB | Available RE-s | Subslot number | Imcs | | | | | | | | | | | | | | | |
| MCS.35-1 | 50 | 1408 | 1 | DTX | 0 | 1 | 3 | 6 | 8 | 9 | 14 | 16 | 16 | 22 | 24 | 27 | 28 | 28 | 28 | Subslot 1 |
| MCS.35-2 | 50 | 1008 | 2 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | Subslot 2 |
| MCS.35-3 | 50 | 872 | 3 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 18 | 20 | 22 | 24 | 25 | Subslot 3 |
| MCS.35-4 | 50 | 1008 | 4 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | Subslot 4 |
| MCS.35-5 | 50 | 1472 | 5 | DTX | 0 | 1 | 3 | 6 | 9 | 9 | 14 | 16 | 16 | 22 | 25 | 27 | 28 | 28 | 28 | Subslot 5 |
| MCS.36-1 | 50 | 1180 | 1 | DTX | 0 | 0 | 2 | 5 | 7 | 9 | 12 | 14 | 16 | 19 | 22 | 24 | 27 | 28 | 28 | Subslot 1 |
| MCS.36-2 | 50 | 680 | 2 | DTX | 0 | 0 | 0 | 2 | 4 | 5 | 10 | 10 | 12 | 17 | 17 | 17 | 19 | 20 | 22 | Subslot 2 |
| MCS.36-3 | 50 | 612 | 3 | DTX | 0 | 0 | 0 | 2 | 3 | 5 | 10 | 10 | 11 | 17 | 17 | 17 | 18 | 19 | 20 | Subslot 3 |
| MCS.36-4 | 50 | 680 | 4 | DTX | 0 | 0 | 0 | 2 | 4 | 5 | 10 | 10 | 12 | 17 | 17 | 17 | 19 | 20 | 20 | Subslot 4 |
| MCS.36-5 | 50 | 1212 | 5 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 12 | 15 | 16 | 20 | 22 | 25 | 27 | 28 | 28 | Subslot 5 |
| MCS.37-1 | 50 | 1180 | 1 | DTX | 0 | 0 | 2 | 5 | 7 | 9 | 12 | 14 | 16 | 19 | 22 | 24 | 27 | 28 | 28 | Subslot 1 |
| MCS.37-2 | 50 | 612 | 2 | DTX | 0 | 0 | 0 | 2 | 3 | 5 | 10 | 10 | 11 | 17 | 17 | 17 | 18 | 19 | 20 | Subslot 2 |
| MCS.37-3 | 50 | 612 | 3 | DTX | 0 | 0 | 0 | 2 | 3 | 5 | 10 | 10 | 11 | 17 | 17 | 17 | 18 | 19 | 20 | Subslot 3 |
| MCS.37-4 | 50 | 680 | 4 | DTX | 0 | 0 | 0 | 2 | 4 | 5 | 10 | 10 | 12 | 17 | 17 | 17 | 19 | 20 | 22 | Subslot 4 |
| MCS.37-5 | 50 | 1212 | 5 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 12 | 15 | 16 | 20 | 22 | 25 | 27 | 28 | 28 | Subslot 5 |
| Note 1: Mapping between Imcs and CQI Index according to Tables 7.1.7.1-1 in TS 36.213 [6].  Note 2: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | | |

Table A.4-19: Mapping of CQI Index to Modulation coding scheme (4-bit CQI Table 5)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Coding Rate | | | OOR | 0.0391 | 0.0762 | 0.1172 | 0.1885 | 0.3008 | 0.4385 | 0.5879 | 0.3691 | 0.4785 | 0.6016 | 0.4551 | 0.5337 | 0.6504 | 0.7439 | 0.8525 |
| Modulation | | | OOR | | | | QPSK | | | | 16QAM | | | | 64QAM | | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.40 | 1 | 126 | DTX | 0 | 0 | 0 | 1 | 4 | 5 | 8 | 12 | 14 | 16 | 18 | 21 | 23 | 25 | 27 |  |
| Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].  Note 2: startSymbolBR = 3 | | | | | | | | | | | | | | | | | | | |

Table A.4-20: Mapping of CQI Index to Modulation coding scheme (4-bit CQI Table 6)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Coding Rate | | | OOR | 0.0547 | 0.2021 | 0.2598 | 0.1904 | 0.1387 | 0.2598 | 0.4424 | 0.6221 | 0.4131 | 0.5439 | 0.6797 | 0.8252 | 0.6357 | 0.7617 | 0.8672 |
| Modulation | | | OOR | | | | QPSK | | | | 16QAM | | | | 64QAM | | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.41 | 3 | 378 | DTX | 0 | 2 | 3 | 2 | 1 | 3 | 7 | 9 | 12 | 15 | 16 | 16 | 22 | 25 | 27 |  |
| Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].  Note 2: startSymbolBR = 3 | | | | | | | | | | | | | | | | | | | |

Table A.4-21: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS index Table 3 and 4-bit CQI Table 4)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Notes |
| Target Spectral Efficiency | | | OOR | 0.1523 | 0.3770 | 0.8770 | 1.4766 | 2.4063 | 3.3223 | 3.9023 | 4.5234 | 5.1152 | 5.5547 | 6.2266 | 6.9141 | 7.4063 | 8.3321 | 9.2578 |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | |
| MCS.38 | 50 | 6300 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 22 | 23 | 25 |  |
| MCS.39 | 100 | 12600 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 22 | 23 | 25 |  |
| Note 1: Mapping between Imcs and CQI Index according to Tables 7.1.7.1-1B, 7.1.7.2.1-1 and 7.2.3-4 in TS 36.213 [6].  Note 2: 3 symbols allocated to PDCCH.  Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | |

Table A.4-22: Mapping of channel quality reported value to Modulation coding scheme

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel quality reported value | | | No measurement | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | Notes |
| Target Spectral Efficiency | | | OOR | 0.4316 | 0.2737 | 0,1579 | 0.0789 | 0.0395 | 0.0198 | 0.6579 | 0.8860 | 1.1316 | 1.4825 | 1.9035 | 2.1140 | 2.5702 | 3.0614 | 3.2719 |
| NPDCCH repetition level | | |  | 1 | 2 | 4 | 8 | 16 | 32 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| NPDSCH repetition | | |  | 1 | 1 | 1 | 2 | 4 | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MCS Scheme | PRB | Available RE-s per subframe | ITBS | | | | | | | | | | | | | | | |
| MCS.42 | 1 | 160 | DTX | 3 | 0 | 0 | 0 | 0 | 0 | 6 | 8 | 10 | 12 | 15 | 16 | 18 | 21 | 21 |  |
| Note 1: Mapping between ITBS and channel quality reported value according to Table 9.1.22.17-1 in TS 36.133 and Table 16.4.1.5.1-1 in TS 36.213.  Note 2: ISF=0 (NSF=1) | | | | | | | | | | | | | | | | | | | |

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