Annex A (normative):  
Measurement channels

# A.1 General

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per datastream (codeword). For multi-stream (more than one codeword) transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all datastreams (codewords).

The UE category entry in the definition of the reference measurement channel in Annex A is only informative and reveals the UE categories, which can support the corresponding measurement channel. Whether the measurement channel is used for testing a certain UE category or not is specified in the individual minimum requirements.

# A.2 UL reference measurement channels for E-UTRA TDD Config 2

## A.2.1 General

The measurement channels in the following clauses are defined to derive the requirements in clause 6 (Transmitter Characteristics) and clause 7 (Receiver Characteristics). The measurement channels represent example configurations of physical channels for different data rates.

## A.2.2 Reference measurement channels for E-UTRA

### A.2.2.1 Full RB allocation

#### A.2.2.1.1 QPSK

Table A.2.2.1.1-1: Reference Channels for QPSK with full RB allocation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (NOTE 2) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 3) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/5 | 1/6 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 600 | 1544 | 2216 | 5160 | 4392 | 4584 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | |

#### A.2.2.1.2 16-QAM

**Table A.2.2.1.2-1: Reference Channels for 16-QAM with full RB allocation**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (NOTE 2) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 3) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 3/4 | 1/2 | 1/3 | 3/4 | 1/2 | 1/3 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 2600 | 4264 | 4968 | 21384 | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | |

#### A.2.2.1.3 64-QAM

**Table A.2.2.1.3-1: Reference Channels for 64-QAM with full RB allocation**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (NOTE 2) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 3) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 3752 | 9528 | 15840 | 31704 | 46888 | 63776 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 1 | 2 | 3 | 6 | 8 | 11 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 5184 | 12960 | 21600 | 43200 | 64800 | 86400 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category (NOTE 4) |  | 5, 8 | 5, 8 | 5, 8 | 5, 8 | 5, 8 | 5, 8 |
| UE UL Cateogry (NOTE 4) |  | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7]  NOTE 4: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category. | | | | | | | |

#### A.2.2.1.4 256 QAM

**Table A.2.2.1.4-1: Reference Channels for 256 QAM with full RB allocation**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (NOTE 2) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 3) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 5160 | 12960 | 21384 | 42368 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 1 | 3 | 4 | 8 | 11 | 15 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 | Bits | 6912 | 17280 | 28800 | 57600 | 86400 | 115200 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,7 |  | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE UL Cateogry |  | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | |

### A.2.2.2 Partial RB allocation

#### A.2.2.2.1 QPSK

**Table A.2.2.2.1-1: Reference Channels for QPSK with partial RB allocation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UL-DL Configuration (NOTE 2) | Special subframe configuration (NOTE 3) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 7 | Transport block CRC | Number of code blocks per Sub-Frame (NOTE 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 7 | Total symbols per Sub-Frame for Sub-Frame 2, 7 | UE Category |
| Unit | MHz |  |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 2 | 7 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | ≥ 1 |
|  | 1.4 - 20 | 2 | 2 | 7 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | ≥ 1 |
|  | 1.4 - 20 | 3 | 2 | 7 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | ≥ 1 |
|  | 1.4 - 20 | 4 | 2 | 7 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | ≥ 1 |
|  | 1.4 - 20 | 5 | 2 | 7 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | ≥ 1 |
|  | 3-20 | 6 | 2 | 7 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | ≥ 1 |
|  | 3-20 | 8 | 2 | 7 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | ≥ 1 |
|  | 3-20 | 9 | 2 | 7 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | ≥ 1 |
|  | 3-20 | 10 | 2 | 7 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
|  | 3-20 | 12 | 2 | 7 | 12 | QPSK | 1/3 | 1224 | 24 | 1 | 3456 | 1728 | ≥ 1 |
|  | 5-20 | 15 | 2 | 7 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | ≥ 1 |
|  | 5-20 | 16 | 2 | 7 | 12 | QPSK | 1/3 | 1384 | 24 | 1 | 4608 | 2304 | ≥ 1 |
|  | 5-20 | 18 | 2 | 7 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | ≥ 1 |
|  | 5-20 | 20 | 2 | 7 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
|  | 5-20 | 24 | 2 | 7 | 12 | QPSK | 1/3 | 2472 | 24 | 1 | 6912 | 3456 | ≥ 1 |
|  | 10-20 | 25 | 2 | 7 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 7200 | 3600 | ≥ 1 |
|  | 10-20 | 27 | 2 | 7 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 7776 | 3888 | ≥ 1 |
|  | 10-20 | 30 | 2 | 7 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
|  | 10-20 | 32 | 2 | 7 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 9216 | 4608 | ≥ 1 |
|  | 10-20 | 36 | 2 | 7 | 12 | QPSK | 1/3 | 3752 | 24 | 1 | 10368 | 5184 | ≥ 1 |
|  | 10-20 | 40 | 2 | 7 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
|  | 10-20 | 45 | 2 | 7 | 12 | QPSK | 1/3 | 4008 | 24 | 1 | 12960 | 6480 | ≥ 1 |
|  | 10-20 | 48 | 2 | 7 | 12 | QPSK | 1/3 | 4264 | 24 | 1 | 13824 | 6912 | ≥ 1 |
|  | 15 - 20 | 50 | 2 | 7 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
|  | 15 - 20 | 54 | 2 | 7 | 12 | QPSK | 1/3 | 4776 | 24 | 1 | 15552 | 7776 | ≥ 1 |
|  | 15 - 20 | 60 | 2 | 7 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
|  | 15 - 20 | 64 | 2 | 7 | 12 | QPSK | 1/4 | 4584 | 24 | 1 | 18432 | 9216 | ≥ 1 |
|  | 15 - 20 | 72 | 2 | 7 | 12 | QPSK | 1/4 | 5160 | 24 | 1 | 20736 | 10368 | ≥ 1 |
|  | 20 | 75 | 2 | 7 | 12 | QPSK | 1/5 | 4392 | 24 | 1 | 21600 | 10800 | ≥ 1 |
|  | 20 | 80 | 2 | 7 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
|  | 20 | 81 | 2 | 7 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23328 | 11664 | ≥ 1 |
|  | 20 | 90 | 2 | 7 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 1 |
|  | 20 | 96 | 2 | 7 | 12 | QPSK | 1/6 | 4264 | 24 | 1 | 27648 | 13824 | ≥ 1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | | | | | | | |

#### A.2.2.2.2 16-QAM

**Table A.2.2.2.2-1: Reference Channels for 16QAM with partial RB allocation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UL-DL Configuration (NOTE 2) | Special subframe configuration (NOTE 3) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 7 | Transport block CRC | Number of code blocks per Sub-Frame (NOTE 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 7 | Total symbols per Sub-Frame for Sub-Frame 2, 7 | UE Category |
| Unit | MHz |  |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 2 | 7 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | ≥ 1 |
|  | 1.4 - 20 | 2 | 2 | 7 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | ≥ 1 |
|  | 1.4 - 20 | 3 | 2 | 7 | 12 | 16QAM | 3/4 | 1288 | 24 | 1 | 1728 | 432 | ≥ 1 |
|  | 1.4 - 20 | 4 | 2 | 7 | 12 | 16QAM | 3/4 | 1736 | 24 | 1 | 2304 | 576 | ≥ 1 |
|  | 1.4 - 20 | 5 | 2 | 7 | 12 | 16QAM | 3/4 | 2152 | 24 | 1 | 2880 | 720 | ≥ 1 |
|  | 3-20 | 6 | 2 | 7 | 12 | 16QAM | 3/4 | 2600 | 24 | 1 | 3456 | 864 | ≥ 1 |
|  | 3-20 | 8 | 2 | 7 | 12 | 16QAM | 3/4 | 3496 | 24 | 1 | 4608 | 1152 | ≥ 1 |
|  | 3-20 | 9 | 2 | 7 | 12 | 16QAM | 3/4 | 3880 | 24 | 1 | 5184 | 1296 | ≥ 1 |
|  | 3-20 | 10 | 2 | 7 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 1 |
|  | 3-20 | 12 | 2 | 7 | 12 | 16QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1728 | ≥ 1 |
|  | 5-20 | 15 | 2 | 7 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | ≥ 1 |
|  | 5-20 | 16 | 2 | 7 | 12 | 16QAM | 1/2 | 4584 | 24 | 1 | 9216 | 2304 | ≥ 1 |
|  | 5-20 | 18 | 2 | 7 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | ≥ 1 |
|  | 5-20 | 20 | 2 | 7 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 1 |
|  | 5-20 | 24 | 2 | 7 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 13824 | 3456 | ≥ 1 |
|  | 10-20 | 25 | 2 | 7 | 12 | 16QAM | 1/3 | 4968 | 24 | 1 | 14400 | 3600 | ≥ 1 |
|  | 10-20 | 27 | 2 | 7 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 15552 | 3888 | ≥ 1 |
|  | 10-20 | 30 | 2 | 7 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
|  | 10-20 | 32 | 2 | 7 | 12 | 16QAM | 3/4 | 13536 | 24 | 3 | 18432 | 4608 | ≥ 2 |
|  | 10-20 | 36 | 2 | 7 | 12 | 16QAM | 3/4 | 15264 | 24 | 3 | 20736 | 5184 | ≥ 2 |
|  | 10-20 | 40 | 2 | 7 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
|  | 10-20 | 45 | 2 | 7 | 12 | 16QAM | 3/4 | 19080 | 24 | 4 | 25920 | 6480 | ≥ 2 |
|  | 10-20 | 48 | 2 | 7 | 12 | 16QAM | 3/4 | 20616 | 24 | 4 | 27648 | 6912 | ≥ 2 |
|  | 15 - 20 | 50 | 2 | 7 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
|  | 15 - 20 | 54 | 2 | 7 | 12 | 16QAM | 3/4 | 22920 | 24 | 4 | 31104 | 7776 | ≥ 2 |
|  | 15 - 20 | 60 | 2 | 7 | 12 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |
|  | 15 - 20 | 64 | 2 | 7 | 12 | 16QAM | 2/3 | 25456 | 24 | 4 | 36864 | 9216 | ≥ 2 |
|  | 15 - 20 | 72 | 2 | 7 | 12 | 16QAM | 1/2 | 20616 | 24 | 4 | 41472 | 10368 | ≥ 2 |
|  | 20 | 75 | 2 | 7 | 12 | 16QAM | 1/2 | 21384 | 24 | 4 | 43200 | 10800 | ≥ 2 |
|  | 20 | 80 | 2 | 7 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
|  | 20 | 81 | 2 | 7 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46656 | 11664 | ≥ 2 |
|  | 20 | 90 | 2 | 7 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 2 |
|  | 20 | 96 | 2 | 7 | 12 | 16QAM | 2/5 | 22152 | 24 | 4 | 55296 | 13824 | ≥ 2 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | | | | | | | |

#### A.2.2.2.3 64-QAM

**Table A.2.2.2.3-1: Reference Channels for 64-QAM with partial RB allocation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UL-DL Configuration (NOTE 2) | Special subframe configuration (NOTE 3) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 7 | Trans-port block CRC | Number of code blocks per Sub-Frame (NOTE 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 7 | Total symbols per Sub-Frame for Sub-Frame 2, 7 | UE Category (NOTE 4) |
| Unit | MHz |  |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 2 | 7 | 12 | 64QAM | 3/4 | 616 | 24 | 1 | 864 | 144 | 5,8 |
|  | 1.4 - 20 | 2 | 2 | 7 | 12 | 64QAM | 3/4 | 1256 | 24 | 1 | 1728 | 288 | 5,8 |
|  | 1.4 - 20 | 3 | 2 | 7 | 12 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 | 5,8 |
|  | 1.4 - 20 | 4 | 2 | 7 | 12 | 64QAM | 3/4 | 2536 | 24 | 1 | 3456 | 576 | 5,8 |
|  | 1.4 - 20 | 5 | 2 | 7 | 12 | 64QAM | 3/4 | 3112 | 24 | 1 | 4320 | 720 | 5,8 |
|  | 3-20 | 6 | 2 | 7 | 12 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 | 5,8 |
|  | 3-20 | 8 | 2 | 7 | 12 | 64QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1152 | 5,8 |
|  | 3-20 | 9 | 2 | 7 | 12 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 | 5,8 |
|  | 3-20 | 10 | 2 | 7 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 |
|  | 3-20 | 12 | 2 | 7 | 12 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 | 5,8 |
|  | 5-20 | 15 | 2 | 7 | 12 | 64QAM | 3/4 | 9528 | 24 | 2 | 12960 | 2160 | 5,8 |
|  | 5-20 | 16 | 2 | 7 | 12 | 64QAM | 3/4 | 10296 | 24 | 2 | 13824 | 2304 | 5,8 |
|  | 5-20 | 18 | 2 | 7 | 12 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 | 5,8 |
|  | 5-20 | 20 | 2 | 7 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 |
|  | 5-20 | 24 | 2 | 7 | 12 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 | 5,8 |
|  | 10-20 | 25 | 2 | 7 | 12 | 64QAM | 3/4 | 15840 | 24 | 3 | 21600 | 3600 | 5,8 |
|  | 10-20 | 27 | 2 | 7 | 12 | 64QAM | 3/4 | 16992 | 24 | 3 | 23328 | 3888 | 5,8 |
|  | 10-20 | 30 | 2 | 7 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 |
|  | 10-20 | 32 | 2 | 7 | 12 | 64QAM | 3/4 | 20616 | 24 | 4 | 27648 | 4608 | 5,8 |
|  | 10-20 | 36 | 2 | 7 | 12 | 64QAM | 3/4 | 22920 | 24 | 4 | 31104 | 5184 | 5,8 |
|  | 10-20 | 40 | 2 | 7 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 |
|  | 10-20 | 45 | 2 | 7 | 12 | 64QAM | 3/4 | 28336 | 24 | 5 | 38880 | 6480 | 5,8 |
|  | 10-20 | 48 | 2 | 7 | 12 | 64QAM | 3/4 | 30576 | 24 | 5 | 41472 | 6912 | 5,8 |
|  | 15 - 20 | 50 | 2 | 7 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 |
|  | 15 - 20 | 54 | 2 | 7 | 12 | 64QAM | 3/4 | 34008 | 24 | 6 | 46656 | 7776 | 5,8 |
|  | 15 - 20 | 60 | 2 | 7 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 |
|  | 15 - 20 | 64 | 2 | 7 | 12 | 64QAM | 3/4 | 40576 | 24 | 7 | 55296 | 9216 | 5,8 |
|  | 1.4 - 20 | 1 | 2 | 7 | 12 | 64QAM | 3/4 | 616 | 24 | 1 | 864 | 144 | 5,8 |
|  | 1.4 - 20 | 2 | 2 | 7 | 12 | 64QAM | 3/4 | 1256 | 24 | 1 | 1728 | 288 | 5,8 |
|  | 1.4 - 20 | 3 | 2 | 7 | 12 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 | 5,8 |
|  | 1.4 - 20 | 4 | 2 | 7 | 12 | 64QAM | 3/4 | 2536 | 24 | 1 | 3456 | 576 | 5,8 |
|  | 1.4 - 20 | 5 | 2 | 7 | 12 | 64QAM | 3/4 | 3112 | 24 | 1 | 4320 | 720 | 5,8 |
|  | 3-20 | 6 | 2 | 7 | 12 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 | 5,8 |
|  | 3-20 | 8 | 2 | 7 | 12 | 64QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1152 | 5,8 |
|  | 3-20 | 9 | 2 | 7 | 12 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 | 5,8 |
|  | 3-20 | 10 | 2 | 7 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 |
|  | 3-20 | 12 | 2 | 7 | 12 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 | 5,8 |
|  | 5-20 | 15 | 2 | 7 | 12 | 64QAM | 3/4 | 9528 | 24 | 2 | 12960 | 2160 | 5,8 |
|  | 5-20 | 16 | 2 | 7 | 12 | 64QAM | 3/4 | 10296 | 24 | 2 | 13824 | 2304 | 5,8 |
|  | 5-20 | 18 | 2 | 7 | 12 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 | 5,8 |
|  | 5-20 | 20 | 2 | 7 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 |
|  | 5-20 | 24 | 2 | 7 | 12 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 | 5,8 |
|  | 10-20 | 25 | 2 | 7 | 12 | 64QAM | 3/4 | 15840 | 24 | 3 | 21600 | 3600 | 5,8 |
|  | 10-20 | 27 | 2 | 7 | 12 | 64QAM | 3/4 | 16992 | 24 | 3 | 23328 | 3888 | 5,8 |
|  | 10-20 | 30 | 2 | 7 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 |
|  | 15 - 20 | 50 | 2 | 7 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 |
|  | 15 - 20 | 54 | 2 | 7 | 12 | 64QAM | 3/4 | 34008 | 24 | 6 | 46656 | 7776 | 5,8 |
|  | 15 - 20 | 60 | 2 | 7 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 |
|  | 15 - 20 | 64 | 2 | 7 | 12 | 64QAM | 3/4 | 40576 | 24 | 7 | 55296 | 9216 | 5,8 |
|  | 15 - 20 | 72 | 2 | 7 | 12 | 64QAM | 3/4 | 45352 | 24 | 8 | 62208 | 10368 | 5,8 |
|  | 20 | 75 | 2 | 7 | 12 | 64QAM | 3/4 | 46888 | 24 | 8 | 64800 | 10800 | 5,8 |
|  | 20 | 80 | 2 | 7 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 |
|  | 20 | 81 | 2 | 7 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69984 | 11664 | 5,8 |
|  | 20 | 90 | 2 | 7 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 |
|  | 20 | 96 | 2 | 7 | 12 | 64QAM | 3/4 | 61664 | 24 | 11 | 82944 | 13824 | 5,8 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7].  NOTE 3: As per Table 4.2-1 in TS 36.211 [7]  NOTE 4: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category | | | | | | | | | | | | | |

#### A.2.2.2.4 256 QAM

**Table A.2.2.2.4-1: Reference Channels for 256 QAM with partial RB allocation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UL-DL Configuration (NOTE 2) | Special Slot Configuration (NOTE 3) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 7 | Trans-port block CRC | Number of code blocks per Sub-Frame (NOTE 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 7 | Total symbols per Sub-Frame for Sub-Frame 2, 7 | UE UL Cateogry |
| Unit | MHz |  |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 2 | 7 | 12 | 256QAM | 3/4 | 840 | 24 | 1 | 1152 | 144 | ≥ 15 |
|  | 1.4 - 20 | 2 | 2 | 7 | 12 | 256QAM | 3/4 | 1672 | 24 | 1 | 2304 | 288 | ≥ 15 |
|  | 1.4 - 20 | 3 | 2 | 7 | 12 | 256QAM | 3/4 | 2536 | 24 | 1 | 3456 | 432 | ≥ 15 |
|  | 1.4 - 20 | 4 | 2 | 7 | 12 | 256QAM | 3/4 | 3368 | 24 | 1 | 4608 | 576 | ≥ 15 |
|  | 1.4 - 20 | 5 | 2 | 7 | 12 | 256QAM | 3/4 | 4264 | 24 | 1 | 5760 | 720 | ≥ 15 |
|  | 3-20 | 6 | 2 | 7 | 12 | 256QAM | 3/4 | 5160 | 24 | 1 | 6912 | 864 | ≥ 15 |
|  | 3-20 | 8 | 2 | 7 | 12 | 256QAM | 3/4 | 6712 | 24 | 2 | 9216 | 1152 | ≥ 15 |
|  | 3-20 | 9 | 2 | 7 | 12 | 256QAM | 3/4 | 7736 | 24 | 2 | 10368 | 1296 | ≥ 15 |
|  | 3-20 | 10 | 2 | 7 | 12 | 256QAM | 3/4 | 8504 | 24 | 2 | 11520 | 1440 | ≥ 15 |
|  | 3-20 | 12 | 2 | 7 | 12 | 256QAM | 3/4 | 10296 | 24 | 2 | 13824 | 1728 | ≥ 15 |
|  | 5-20 | 15 | 2 | 7 | 12 | 256QAM | 3/4 | 12960 | 24 | 3 | 17280 | 2160 | ≥ 15 |
|  | 5-20 | 16 | 2 | 7 | 12 | 256QAM | 3/4 | 13536 | 24 | 3 | 18432 | 2304 | ≥ 15 |
|  | 5-20 | 18 | 2 | 7 | 12 | 256QAM | 3/4 | 15264 | 24 | 3 | 20736 | 2592 | ≥ 15 |
|  | 5-20 | 20 | 2 | 7 | 12 | 256QAM | 3/4 | 16992 | 24 | 3 | 23040 | 2880 | ≥ 15 |
|  | 5-20 | 24 | 2 | 7 | 12 | 256QAM | 3/4 | 20616 | 24 | 4 | 27648 | 3456 | ≥ 15 |
|  | 10-20 | 25 | 2 | 7 | 12 | 256QAM | 3/4 | 21384 | 24 | 4 | 28800 | 3600 | ≥ 15 |
|  | 10-20 | 27 | 2 | 7 | 12 | 256QAM | 3/4 | 22920 | 24 | 4 | 31104 | 3888 | ≥ 15 |
|  | 10-20 | 30 | 2 | 7 | 12 | 256QAM | 3/4 | 25456 | 24 | 5 | 34560 | 4320 | ≥ 15 |
|  | 10-20 | 32 | 2 | 7 | 12 | 256QAM | 3/4 | 27376 | 24 | 5 | 36864 | 4608 | ≥ 15 |
|  | 10-20 | 36 | 2 | 7 | 12 | 256QAM | 3/4 | 30576 | 24 | 6 | 41472 | 5184 | ≥ 15 |
|  | 10-20 | 40 | 2 | 7 | 12 | 256QAM | 3/4 | 34008 | 24 | 6 | 46080 | 5760 | ≥ 15 |
|  | 10-20 | 45 | 2 | 7 | 12 | 256QAM | 3/4 | 37888 | 24 | 7 | 51840 | 6480 | ≥ 15 |
|  | 10-20 | 48 | 2 | 7 | 12 | 256QAM | 3/4 | 40576 | 24 | 8 | 55296 | 6912 | ≥ 15 |
|  | 15 - 20 | 50 | 2 | 7 | 12 | 256QAM | 3/4 | 42368 | 24 | 8 | 57600 | 7200 | ≥ 15 |
|  | 15 - 20 | 54 | 2 | 7 | 12 | 256QAM | 3/4 | 46888 | 24 | 8 | 62208 | 7776 | ≥ 15 |
|  | 15 - 20 | 60 | 2 | 7 | 12 | 256QAM | 3/4 | 51024 | 24 | 9 | 69120 | 8640 | ≥ 15 |
|  | 15 - 20 | 64 | 2 | 7 | 12 | 256QAM | 3/4 | 55056 | 24 | 9 | 73728 | 9216 | ≥ 15 |
|  | 15 - 20 | 72 | 2 | 7 | 12 | 256QAM | 3/4 | 61664 | 24 | 11 | 82944 | 10368 | ≥ 15 |
|  | 20 | 75 | 2 | 7 | 12 | 256QAM | 3/4 | 63776 | 24 | 11 | 86400 | 10800 | ≥ 15 |
|  | 20 | 80 | 2 | 7 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 92160 | 11520 | ≥ 15 |
|  | 20 | 81 | 2 | 7 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 93312 | 11664 | ≥ 15 |
|  | 20 | 90 | 2 | 7 | 12 | 256QAM | 3/4 | 76208 | 24 | 13 | 103680 | 12960 | ≥ 15 |
|  | 20 | 96 | 2 | 7 | 12 | 256QAM | 3/4 | 81176 | 24 | 14 | 110592 | 13824 | ≥ 15 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)  NOTE 2: As per Table 4.2-2 in TS 36.211 [7]  NOTE 3: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | | | | | | | |

# A.3 DL reference measurement channels for E-UTRA

## A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

Unless otherwise stated, no user data is scheduled on subframes #5 in order to facilitate the transmission of system information blocks (SIB).

The algorithm for determining the payload size *A* is as follows; given a desired coding rate *R* and radio block allocation *N*RB

1. Calculate the number of channel bits *N*ch that can be transmitted during the first transmission of a given sub-frame.

2. Find *A* such that the resulting coding rate is as close to *R* as possible, that is,

,

subject to

a) A is a valid TB size according to clause 7.1.7 of TS 36.213 [6] assuming an allocation of *N*RB resource blocks.

b) *C* is the number of Code Blocks calculated according to clause 5.1.2 of TS 36.212 [5].

3. If there is more than one *A* that minimizes the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.

4. For TDD, the measurement channel is based on DL/UL configuration ratio of 3DL+DwPTS (10 OFDM symbol SSF7): 1UL

### A.3.1.1 QPSK

Table A.3.1.1-1: Fixed Reference Channel for Receiver Requirements (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (NOTE 5) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 6) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| Allocated subframes per Radio Frame (D+S) |  | 3 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmission |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 3, 4, 8, 9 |  | 408 | 1320 | 2216 | 4392 | 6712 | 8760 |
| For Sub-Frame 1, 6 |  | N/A | 776 | 1288 | 2664 | 4008 | 5352 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 208 | 1064 | 1800 | 4392 | 6712 | 8760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (NOTE 4) |  |  |  |  |  |  |  |
| For Sub-Frame 3, 4, 8, 9 |  | 1 | 1 | 1 | 1 | 2 | 2 |
| For Sub-Frame 1, 6 |  | N/A | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 1 | 1 | 1 | 2 | 2 |
| Binary Channel Bits Per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 3, 4, 8, 9 |  | 1368 | 3780 | 6300 | 13800 | 20700 | 27600 |
| For Sub-Frame 1, 6 |  | N/A | 2616 | 4456 | 9056 | 13656 | 18256 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 672 | 3084 | 5604 | 13104 | 20004 | 26904 |
| Max. Throughput averaged over 1 frame | kbps | 102.4 | 564 | 932 | 1965.6 | 3007.2 | 3970.4 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| NOTE 1: For normal subframes(0,3,4,5,8,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.  NOTE 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance  NOTE 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [7]  NOTE 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  NOTE 5: As per Table 4.2-2 in TS 36.211 [7]  NOTE 6: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | |

### A.3.1.2 64-QAM

**Table A.3.1.2-1: Fixed Reference Channel for Maximum input level for UE Categories ≥ 3 (TDD)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (NOTE 5) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 6) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| Allocated subframes per Radio Frame |  | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3, 4, 8, 9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frames 1,6 | Bits | N/A | 5544 | 9528 | 19848 | 30576 | 40576 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 6968 | 12576 | 30576 | 45352 | 61664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (NOTE 4) |  |  |  |  |  |  |  |
| For Sub-Frames 3, 4, 8, 9 |  | 1 | 2 | 3 | 5 | 8 | 11 |
| For Sub-Frames 1,6 |  | N/A | 2 | 2 | 4 | 6 | 8 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3, 4, 8, 9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frames 1,6 |  | N/A | 7848 | 13368 | 27168 | 40968 | 54768 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9252 | 16812 | 39312 | 60012 | 80712 |
| Max. Throughput averaged over 1 frame | kbps | 596.8 | 3791.2 | 6369.6 | 13910 | 20945 | 27877 |
| NOTE 1: For normal subframes(0,3,4,5,8,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.  NOTE 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.  NOTE 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [7].  NOTE 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  NOTE 5: As per Table 4.2-2 in TS 36.211 [7].  NOTE 6: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | |

### A.3.1.3 256-QAM

Table A.3.1.3-1: Fixed Reference Channel for Maximum input level for UE Categories 11/12 and UE DL categories ≥ 11 (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (NOTE 5) |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Special subframe configuration (NOTE 6) |  | 7 | 7 | 7 | 7 | 7 | 7 |
| Allocated subframes per Radio Frame |  | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding Rate |  | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 4392 | 12216 | 19848 | 42368 | 63776 | 84760 |
| For Sub-Frames 1,6 | Bits | N/A | 10464 | 17824 | 36224 | 54624 | 73024 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9912 | 17568 | 42368 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (NOTE 4) |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 1 | 2 | 4 | 7 | 11 | 14 |
| For Sub-Frames 1,6 |  | N/A | 2 | 3 | 6 | 9 | 13 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 3 | 7 | 11 | 14 |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 5472 | 15120 | 25200 | 55200 | 82800 | 110400 |
| For Sub-Frames 1,6 |  | N/A | 8248 | 13536 | 27376 | 40576 | 55056 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 12336 | 22416 | 52416 | 80016 | 107616 |
| Max. Throughput averaged over 1 frame | kbps | 878.4 | 5570.4 | 9240 | 20049.6 | 30144 | 40503.2 |
| NOTE 1: For normal subframes(0,3,4,5,8,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.  NOTE 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.  NOTE 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [7].  NOTE 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).  NOTE 5: As per Table 4.2-2 in TS 36.211 [7].  NOTE 6: As per Table 4.2-1 in TS 36.211 [7] | | | | | | | |

Annex B: Void

Annex C: Void

Annex D: Void

Annex E: Void

Annex F: Void

Annex G: Void

Annex H (normative):  
Modified MPR behavior

Annex I (normative):  
Dual uplink interferer

UE is mandated to support operation in dual and triple uplink mode for EN-DC configuration in NR FR1 listed in Table 5.5B.2-1, Table 5.5B.3-1, and Table 5.5B.4.1-1 and indicated by column single uplink allowed, Table 7.3B.2.3.5.1-1, Table 7.3B.2.3.5.2-0, Table 7.3B.2.3.5.2-1 or NE-DC configuration in NR FR1 listed in Table 5.5B.4a.1-1 and indicated by column single uplink allowed if the intermodulation products caused by the dual uplink operation do not interfere with its own primary downlink transmission channel bandwidth of PCell or PSCell. For intermodulation products falling into any secondary downlink channel bandwidth, UE single UL capability is not considered.

Formula for determining if the EN-DC in NR FR1 configuration with dual uplink operation interferes with its own downlink reception.

Interference bandwidth: IBW = |a| \* CBW1 + |b| \* CBW2

- |a| + |b| = 2 (or 3)

- CBW1 and CBW2 are the transmission bandwidth configurations of the UL channels

Center frequency of IBW: fIBW = |a \* f1 + b \* f2|

- f1 and f2 are center frequency of the transmission bandwidth configurations of each UL channel

The range of IMD 2 (or 3): [fIBW – IBW/2, fIBW + IBW/2]

NOTE 1: UE shall be able to apply operations which are configured by RRC reconfiguration and corresponding HARQ timing on the transmission bandwidth.

NOTE 2: For identified difficult band combination, during two adjacent RRC reconfiguration, the changing of transmission bandwidth should not introduce IM2 and IM3, which will result in UE changing from 2Tx to 1Tx. Otherwise, UE behavior is not specified.

For DC\_3A\_n3A intra-band non-contiguous EN-DC combination, only single switched UL is supported in Rel-15.

Annex J: Void

Annex K: Void

Annex L (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2017-08 | RAN4#84 |  |  |  |  | Initial Skeleton | 0.0.1 |
| 2017-11 | RAN4#84Bis | R4-1711980 |  |  |  | Number TPs from editors | 0.1.0 |
| 2017-12 | RAN4#85 | R4-1713807 |  |  |  | Approved TPs in RAN4#85  R4-1714444, CA BW classes, TP, Ericsson  R4-1714170, How to list DC configurations into TS 38.101-3, Nokia  R4-1714530, TP on introducing operating bands for NR-LTE DC including SUL band combinations in 38.101-3 , Qualcomm  R4-1714098, TP to TS 38.101-3: UE RF requirements for non-standalone SUL, Huawei  R4-1713206, TP on general parts for 38.101-3 NR interwork, Ericsson  R4-1714443, TP to TS 38.101-3: On dual uplink operation for EN-DC in NR FR1 and single uplink, Nokia  R4-1714450, TP to 38.101-3: maximum output power and unwanted emissions for EN-DC, Ericsson  R4-1714346, TP to 38.101-3: REFSENS for intra-band EN-DC, Ericsson  R4-1714345, TP for TS 36.101-3: clause 7 receiver requirements, Huawei  Band list according to R4-1714542, List of bands and band combinations to be introduced into RAN4 NR core requirements by December 2017, RAN4 Chairmen | 0.2.0 |
| 2017-12 | RAN4#85 | R4-1714571 |  |  |  | Further corrections after email review | 0.3.0 |
| 2017-12 | RAN#78 | RP-172477 |  |  |  | v1.0.0 submitted for plenary approval. Contents same as 0.3.0 | 1.0.0 |
| 2017-12 | RAN#78 |  |  |  |  | Approved by plenary – Rel-15 spec under change control | 15.0.0 |
| 2018-03 | RAN#79 | RP-180264 | 0005 |  | F | Implementation of endorsed CRs to 38.101-3  Endorsed draft CR  F: R4-1801267, Draft CR on UE RF requirements for SUL in TS 38.101-3, Huawei  B: R4-1801111, Draft CR for completed LTE 1CC + NR 1band for TS 38.101-3, NTT DOCOMO, INC.  B: R4-1800716, Draft CR for introduction of completed band combinations from 37.863-03-01 into 38.101-3, Ericsson  B: R4-1800063, Draft CR for completed EN-DC of LTE 4CC + NR 1band for TS 38.101-3, Nokia  B: R4-1800717, Draft CR for introduction of completed band combinations from 37.865-01-01 into 38.101-3, Ericsson  F: R4-1800049, Modification for TS38.101-3, CATT  F: R4-1800287, 38.101-3 DC\_(n)71B draft CR for section 6.2.4.1 - A-MPR for intra-band EN-DC - NS value, T-Mobile USA Inc.  F: R4-1800288, 38.101-3 DC\_(n)71B draft CR for section 7.3.3 Reference sensitivity for DC\_(n)71B - MSD values, T-Mobile USA Inc.  F: R4-1801139 Draft CR to 38.101-3: MSD for inter-band EN-DC, Ericsson | 15.1.0 |
| 2018-06 | RAN#80 | RP-181374 | 0013 | 1 | F | CR to TS 38.101-3: Implementation of endorsed draft CRs from RAN4 #87  **Missing figures (Figure 6.3B.1.1-1, Figure 6.3B.1.1-2, Figure 6.3B.1.1-3 and Figure 6.3B.1.1-4) from the endorsed draftCR (R4-1807235) were added during the CR implementation.** | 15.2.0 |
| 2018-09 | RAN#81 | RP-182129 | 0020 | 2 | F | Big CR for 38.101-3  Draft CRs from RAN4#88:  R4-1809960 Draft CR to TS 38.101-3: to introduce new NR inter-band DC band combinations Samsung,KDDI,SKT,KT,LGU+  R4-1809991 CR to 38.101-3:Corrections on UE coexistence table for Table 6.5B.3.3.1-1 MediaTek Inc.  R4-1810054 Pcmax for Rel-15 inter-band EN-DC for FR1 and NR in FR2 InterDigital, Inc.  R4-1810111 Single UL allowed corrections for DC\_28A-n51A EN-DC in 38.101-3 Skyworks Solutions Inc.  R4-1810125 Draft CR to 38.101-3 Single UL allowed corrections for DC\_28A\_51A EN-DC Skyworks Solutions Inc.  R4-1810128 Draft CR to 38.101-3 Single UL allowed corrections for EN-DC operation in NR FR1 (two bands) Skyworks Solutions Inc.  R4-1810167 TP for TR 37.863-01-01: MSD for DC\_5A\_n78A due to the 4th harmonic MediaTek Inc.  R4-1810410 Draft CR to 38.101-3: Corrections on symbols and abbreviations in section 3 ZTE Corporation  R4-1810417 Correction to DC\_(n)71B MSD definition Nokia  R4-1810433 Correction on EN-DC 8A\_n79A SoftBank Corp.,ZTE  R4-1810476 Draft CR to TS 38.101-3 correction for DC\_3\_n3-n77, DC\_3\_n3-n78 CHTTL  R4-1810976 Annex lettering change for 38.101-3 Qualcomm Incorporated  R4-1811461 Clarification and corrections of EN-DC REFSENS exceptions requirement Nokia, Nokia Shanghai Bell  R4-1811462 Correction to DC\_(n)71B scs restriction for NR Nokia  R4-1811466 EN DC\_41-79 CATT  R4-1811467 Draft CR TS 38.101-3 Corrections to Single UL Allowed Criteria for Mid-Band EN-DC in FR1 Skyworks Solutions Inc.  R4-1811484 Pcmax for inter-band EN-DC FR1 draft CR InterDigital, Inc.  R4-1811525 Draft CR TS 38.101-3 on missing requirements for FR1 EN-DC Skyworks Solutions, Inc.  R4-1811542 Draft CR to 38.101-3 on correction on some errors Huawei, HiSilicon  R4-1811796 Draft CR to 38.101-3 Corrections to Single UL allowed criteria for EN-DC Skyworks Solutions Inc.  R4-1811800 DRAFT CR for PCmax FR2 correction Qualcomm Incorporated  R4-1811810 Draft CR TS 38.101-3: Corrections for B41/n41 SPRINT Corporation | 15.3.0 |
| 2018-12 | RAN#82 | RP-182359 | 0030 |  | F | Endorced draft CRs from RAN4#88Bis :  R4-1812057, Introduction of Intra-band contiguous EN-DC bandwidth classes, Nokia  R4-1812290 Draft CR on MSD for EN-DC including Band 66 and n78 Huawei, HiSilicon  R4-1812293 Draft CR on switching time mask for EN-DC Huawei, HiSilicon  R4-1812298 Draft CR to TS 38.101-3: to add missing requirements for inter-band CA between FR1 and FR2. Samsung  R4-1812360 Draft CR to 38.101-3: Corrrection to UL configuration for EN-DC reference sensitivity exceptions Skyworks Solutions Inc.  R4-1812361 Draft CR to 38.101-3: NR uplink DFT-S-OFDM waveforms for EN-DC reference sensitivity Skyworks Solutions Inc.  R4-1812362 Draft CR to 38.101-3: Editorial and RB allocation corrections to table 7.3B.2.3.4-2 Skyworks Solutions Inc.  R4-1812363 Draft CR to 38.101-3: Single UL allowed operation corrections in clause 7.3B.2.3.5 Skyworks Solutions Inc.  R4-1812404 Non-contiguous intra-band EN-DC emission requirements Qualcomm Incorporated  R4-1812410 Correction on REFSENS exception for EN-DC 41A-n77A/n78A SoftBank Corp.  R4-1812670 Correction on REFSENS exceptions of DC\_5A-7A\_n78A to TS 38.101-3 LG Uplus  R4-1813471 draftCR on applicability of TDD configuratiin for CA in TS 38.101-3 Huawei  R4-1813796 Draft CR for 38.101-3: Intra-band Pcmax for Type 2 UEs Sprint Corporation  R4-1813816 Renaming of DC\_(n)71B into DC\_(n)71AA Nokia  R4-1813817 Correction to EN-DC operating bands and configurations Nokia  R4-1813818 Draft CR on correction REFSENs exceptions due to dual uplink operation for inter-band EN-DC to TS 38.101-3 Samsung  R4-1813822 Draft CR for 38.101-3: Single UL allowed criteria in Annex I Vodafone España SA  R4-1814157 Draft CR for UE-to-UE coexistence requirements for intra-band EN-DC in TS38.101-3 LG Electronics France  R4-1814167 Draft CR on Single UL for some EN-DC combinations Huawei  Endorsed draft CRs from Ran4#89:  R4-1815952 dCR on TS38.101-3 merging draft CRs from RAN4#(88Bis) Qualcomm IncorporatedR4-1814803 Draft CR on editorial error for EN-DC band combinations to TS 38.101-3 Huawei, HiSilicon  R4-1815802 draft CR editorial correction in 38.101-3 Ericsson  R4-1814425 Simplification of requirements for EN-DC configuration including FR2 NTT DOCOMO, INC.  R4-1814512 Draft CR to TS38.101-3\_Corrections on MSD requirments for EN-DC combinations of band 8 and n77 n78(Section 7.3B.2.3.1) ZTE Corporation  R4-1814938 Draft CR to 38.101-3 on operating bands for CA and DC ZTE Corporation Zhifeng Ma  R4-1814976 Correction for Maximum output power for inter-band EN-DC (two bands) Nokia, Nokia Shanghai Bell  R4-1814977 Correction for ?TIB,c for EN-DC Nokia, Nokia Shanghai Bell  R4-1814978 MPR and A-MPR for interband EN-DC Nokia, Nokia Shanghai Bell  R4-1814980 Correction for intra-band EN-DC bandwidth class Nokia, Nokia Shanghai Bell  R4-1815065 draft CR for adding missing transmit singnal quality for inter band EN-DC for TS 38.101-3 NTT DOCOMO, INC.  R4-1815811 draft Rel-15 CR to 38.101-3 to correct n260 BW class Ericsson, AT&T  R4-1815865 Draft CR for 38.101-3 Intra-band EN-DC nominal carrier spacing for 30 kHz raster SPRINT Corporation  R4-1815973 Draft CR to 38.101-3 rel. 15 to fix MSD issues for higher order EN-DC combinations  R4-1816227 Draft CR on Power Class for inter band EN-DC within FR1 OPPO  R4-1816233 Receiver requirements for intra-band EN-DC Qualcomm Incorporated  R4-1816621 Introduction of maxUplinkDutyCycle to ENDC HPUE in FR1 OPPO  R4-1816638 Pcmax computation and evaluation for inter band ENDC Qualcomm  R4-1816178 Draft CR for correction for missing agreed DC combinations in Rel-15 for TS 38.101-3 NTT DOCOMO, INC.  R4-1816197 Draft CR to TS38.101-3\_Clarifications on MSD and UL configuration tables for EN-DC ZTE Corporation  R4-1816198 Simplification of EN-DC and CA between FR1 and FR2 UE to UE co-ex table by adopting CA band approach Nokia, Nokia Shanghai Bell  R4-1816202 Correction to interband EN-DC OOBE emission requirements Nokia, Nokia Shanghai Bell  R4-1816203 Receiver requirements for interband EN-DC Nokia, Nokia Shanghai Bell  R4-1816207 Draft CR to 38.101-3 rel. 15 to fix MPR issue Apple GmbH  R4-1816224 Draft CR for 38.101-3 NS\_04 applicability for intra-band EN-DC SPRINT Corporation  R4-1816231 Draft CR on output power dynamic for DC OPPO  R4-1816237 Correction for Intra-band contiguous EN-DC A-MPR definition Nokia, Nokia Shanghai Bell  R4-1816246 Draft CR to TS38.101-3: Corrections on TS for MSD calculations based on ENDC bands combination including of bands 1,3,8, n77, and n78 MediaTek Inc.  R4-1816247 Draft CR 38-101-3 Corrections for EN-DC Single Uplink allowed Operation Skyworks Solutions Inc.  R4-1816250 draft CR for adding note about the fallback of EN-DC in Applicability of minimum requirements for TS 38.101-3 NTT DOCOMO, INC.  R4-1816608 Draft CR on LTE RMC for TDD EN-DC UE RF Tests Qualcomm Incorporated  R4-1816613 Draft CR for reducing AMPR for DC\_(n)71AA without Dynamic Power Sharing "  Motorola Mobility, T-Mobile" | 15.4.0 |
| 2018-12 | RAN#82 | RP-182773 | 0033 | 1 | F | Completion of configured maximum output power for intra-band contiguous EN-DC | 15.4.0 |
| 2018-12 | RAN#82 | RP-182774 | 0034 | 1 | F | Configured maximum output power for intra-band non-contiguous EN-DC | 15.4.0 |
| 2019-03 | RAN#83 | RP-190403 | 0035 |  | F | CR to TS 38.101-3: Implementation of endorsed draft CRs from RAN4#90  Endorced draft CRs from RAN4#90  R4-1900034, Editorial corrections for 38.101-3, Qualcomm Incorporated  R4-1900460, Draft CR to TS38.101-3\_corrections on MSD, ZTE Corporation  R4-1900461, Draft CR to TS38.101-3\_inter-band NR DC between FR1 and FR2, ZTE Corporation  R4-1900524, Draft CR to TS 38.101-3 on inter-band CA & inter-band EN-DC configurations, ZTE Corporation  R4-1900529, Draft CR to TS 38.101-3 on Single Uplink Allowed for EN-DC combinations of order 3 or higher, ZTE Corporation  R4-1900726, Editorial corrections to delta Tib for EN-DC, Rohde & Schwarz  R4-1901359, draft CR for correction for missing operating band for EN-DC, NTT DOCOMO INC.  R4-1901428, draft CR to make editorial corrections in 38-101-3 Rel-15, Ericsson  R4-1901848, Draft CR for 38.101-3: Addition of default power class, Sprint Corporation  R4-1901850, Draft CR for 38.101-3: Intra-band Pcmax P\_EN-DC\_Total for non-DPS UEs, Sprint Corporation  R4-1901851, Draft CR for 38.101-3: Intra-band Pcmax Editorial corrections, Sprint Corporation  R4-1901874, Guardband for harmonic exception to reference sensitivity, Qualcomm Incorporated  R4-1901878, Non-simultaneous Tx/Rx for TDD intra-band EN-DC, Qualcomm Incorporated  R4-1901890, A-MPR for DC\_(n)71AA without Dynamic Power Sharing, Motorola Mobility France S.A.S  R4-1901926, Draft CR to 38.101-3 to clarify ACS2 wanted level, Qualcomm Incorporated  R4-1901997, draft\_CR TS 38.101-3 type 2 UE DC\_(n)41 and DC\_41\_n41 NS04 AMPR correction, Skyworks Solutions Inc.  R4-1902002, Draft CR to 38.101-3 on DC\_n41-41 – B40 coexistence , Qualcomm Incorporated  R4-1902154, Draft CR to TS38.101-3\_clean up on inter-band CA between FR1 and FR2, ZTE Corporation  R4-1902155, Draft CR for TS 38.101-3: Corrections to Table 7.3B.2.3.5.1-1 for reference sensitivity exceptions (two bands), MediaTek Inc.  R4-1902156, draftCR corrections for TS 38.101-3, Huawei  R4-1902157, CR on intraband ENDC channel configurations, Intel Corporation  R4-1902160, Draft CR on some errors to TS 38.101-3, Huawei  R4-1902161, CR to 38.101-3 to clarify non-simultaneous RXTX capability for co-bands, Qualcomm Incorporated  R4-1902163, Draft CR to 38.101-3 to clarify DL carrier levels for bands in close frequency proximity, Qualcomm Incorporated  R4-1902164, Draft CR to reflect agreed MSD analysis of DC\_25A-n41A for TS 38.101-3, MediaTek Inc.  R4-1902169, draft CR for inter-band EN-DC Pcmax, Huawei  R4-1902172, Draft CR ACLR for NC intra-band EN-DC, Skyworks Solutions Inc.  R4-1902176, Draft CR for 38.101-3 modification of requirements for intra-band non-contiguous EN-DC SEM, Huawei  R4-1902179, draft CR for introduction of Tx IM for Inter-band EN-DC in TS38.101-3, NTT DOCOMO, INC.  R4-1902182, Clarification for OOBE boundary for intra-band contiguous and non-contiguous EN-DC, vivo  R4-1902195, draft\_CR TS 38.101-3 Footnote correction in Table 7.3B.2.3.1-2, Skyworks Solutions Inc.  R4-1902232, Draft CR on SUL band combinations to TS 38.101-3, Huawei  R4-1902478, Addition of power class 2 EN-DC ACLR requirement, Nokia  R4-1902481, draftCR on inter-band EN-DC Rx requirement for TS 38.101-3, Huawei  R4-1902486, Draft CR for 38.101-3 modification of requirements for network signalled value NS\_04, Huawei  R4-1902496, Draft CR for TS 38.101-3: Switching time for intra-band EN-DC upon dual PA UE capability, Huawei  R4-1902500, Draft CR for 38.101-3: adding MPR for intra-band ENDC,Skyworks Solutions Inc  R4-1902660, Introduction of modified MPR for 38.101-3, Nokia  Editorial changes after RAN#83  To align the annex numbering with other specifications (TS 38.101-x series), 'Modified MPR behavior' was moved to annex H. | 15.5.0 |
| 2019-06 | RAN#84 | RP-191240 | 0041 |  | F | CR to TS 38.101-3: Implementation of endorsed draft CRs from RAN4#90bis and RAN4#91  Endorced draft CRs from RAN4#90Bis  R4-1902829, Draft CR for 38.101-3 editoral correction for editorial correction for intra-band contiguous EN-DC uplink configuration when Rx requirements are measured, Huawei  R4-1903074 Draft CR to 38.101-3 rel. 15 to fix missing SUO note Apple Inc.  R4-1903090 Pcmax for Rel-15 intra-band EN-DC within FR1 wrong references - fixes InterDigital Communications  R4-1903150 Draft CR to TS 38.101-3\_Spurious emission and Tx IM for inter-band CA between FR1 and FR2 ZTE Corporation  R4-1903302 Draft CR to TS 38.101-3 correction for the DC\_3\_n3 delta R IBNC table CHTTL  R4-1903426 draft CR for 38.101-3: Reflect the agreed MSD for DC\_5\_n78 China Telecom  R4-1903515 Removal of reference sensitivity exception due to close proximity of bands for EN-DC in NR FR1 clause Nokia  R4-1903958 Completion of defintions of EN-DC configured power Ericsson  R4-1904639 Draft CR to 38.101-3 on DC\_n41-41 – B40 coexistence, Qualcomm Incorporated  R4-1904934 Harmonization of reference sensitivity level for DC clause Nokia  R4-1904935 Change description 4.2(e) in Applicability of minimum requirements for TS 38.101-3 vivo  R4-1904945 Draft CR to TS38.101-3\_adding some exclusion frequencies for SEM and spurious emission for EN-DC ZTE Corporation  R4-1904946 Draft CR to TS 38.101-3 on some minor corrections ZTE Corporation  R4-1904951 Draft CR for 38.101-3 intra-band EN-DC AMPR Huawei  R4-1904953 Draft CR for 38.101-3: NS\_04 A-MPR power class relationship clarification Sprint Corporation  R4-1904959 Draft CR on UE to UE coexistence for TS 38.101-3 Huawei  R4-1904988 Draft CR to 38.101-1. Clarify EN-DC category for requirements of carrier imbalance Qualcomm Incorporated  R4-1904995 draft CR to 38.101-3 Configured output power for inter-band EN-DC including both FR1 and FR2 Intel Corporation  R4-1905085 Draft CR for TR 38.101-3 NE-DC RF requirement Huawei  R4-1904925 Draft CR for improving EN-DC configuration tables in TS38.101-3 CATT  Endorced draft CRs from RAN4#91  R4-1905628 Draft CR to TS38.101-3\_Frequency error for intra-band for EN-DC ZTE Corporation  R4-1905629 Draft CR to TS 38.101-3\_removal of the reference sensitivity exception for NR CA between FR1 and FR2 ZTE Corporation  R4-1905767 draft CR to 38.101-3 Correction ot DeltaTIB,c in configured output power for EN-DC Intel Corporation  R4-1905774 Draft CR to TS38.101-3 Correction to intra-band and inter-band EN-DC Pcmax Intel Corporation  R4-1905793 CR for TS 38.101-3 (Rel-15): Support of n257D-F for DC\_1-42\_n257 and DC\_3-42\_n257 SoftBank Corp.  R4-1905799 Correction of LTE anchor condition to Spurious response for EN-DC Anritsu Corporation  R4-1907057 Draft CR for 38.101-3: Further UE coexistence table clean-up Sprint Corporation  R4-1907063 Draft CR for 38.101-3: Global replacement of LTE with E-UTRA Sprint Corporation  R4-1907136 Draft CR to 38.101-3 rel. 15 to fix missing Exceptions for Out-of-band Blocking Apple  R4-1907137 Draft CR to 38.101-3 rel. 15 to fix missing SUO note Apple  R4-1907181 Draft CR for 38.101-3: Removal of unnecessary ACLR notes Sprint Corporation  R4-1907422 Draft CR for TS 38.101-1 Correction of channel bandwidth set for NR CA Huawei  R4-1907424 Draft CR for clarification of note for B42\_n77 and B42\_n78 NTT DOCOMO, INC.  R4-1907425 DraftCR TS 38.101-3 Corrections to Intra-band ENDC MPR text Skyworks Solutions Inc.  R4-1907426 Definition of BCS support in inter-band EN-DC mode Qualcomm Incorporated  R4-1907448 Correction to EN-DC spurious emissions ROHDE & SCHWARZ  R4-1907476 draft CR for TS 38.101-3 intra-band EN-DC Pcmax Huawei  R4-1907482 Correction of RefSens exceptions due to UL harmonic interference for EN-DC in 38.101-3 vivo  R4-1907483 [Rx]Draft CR for 38.101-3 defining Reference sensitivity for intra-band non-contiguous, Huawei  R4-1907485 Corrections to MPR/A-MPR and additional requirements for intra-band EN-DC Ericsson  R4-1907489 Draft CR to 38.101-3. Revise MSD for DC\_20A-n8A Qualcomm Incorporated  R4-1907492 Modification of reference sensitivity and general spurious emissions in 38.101-3 Qualcomm Incorporated  R4-1907594 draft CR of modification on reference for inter-band EN-DC including FR2 for TS 38.101-3 NTT DOCOMO INC.  R4-1907808 Draft CR to 38.101-3 NE-DC introducation InterDigital Communications | 15.6.0 |
| 2019-12 | RAN#86 | RP-192049 | 0063 |  | F | CR to TS 38.101-3: Implementation of endorsed draft CRs from RAN4#92 (Rel-15)  R4-1907957 Reference sensitivity for intra-band EN-DC with single uplink Qualcomm Incorporated  R4-1908028 Draft CR for handling of fallbacks for combined contiguous and non-contiguous CA in FR2  R4-1908162 dCR to 38.101-3: EN-DC REFSENS editorial updates Qualcomm Incorporated  R4-1908376 Draft CR for TS38.101-3, Editorial corrections CATT  R4-1908434 Further correction of RefSens exceptions due to UL harmonic interference for EN-DC in 38.101-3 vivo  R4-1908692 Editorial correction on SUO mark for BC 3+78 Apple Inc.  R4-1908959 Draft CR for 38.101-3 adding note for spurious emission band UE co-existence Huawei, HiSilicon  R4-1908960 Draft CR for 38.101-3 clean up for inter-band NE-DC Huawei, HiSilicon  R4-1909065 Draft CR for efitorial correction on EN-DC of 4LTE bands + 1NR band for Rel-15 TS 38.101-3 NTT DOCOMO, INC.  R4-1909354 Draft CR to TS 38.101-3 on UE additional maximum output power reduction for EN-DC ZTE Corporation  R4-1909357 Draft CR to TS 38.101-3 on UE maximum output power for DC ZTE Corporation  R4-1909798 Correction of DC configurations in tables chapter 5 Ericsson  R4-1909903 Draft CR for 38.101-3: Correction of Note 2 in Table 5.5B.2-1 Sprint, Ericsson, Google  R4-1909956 dCR to 38.101-3 EN-DC RX Out-of-Band Blocking for Inter-bands treated as Intra-band Qualcomm Inc.  R4-1909977 draftCR to 38.101-3 for missing Harmonic Mixing MSD fo DC\_11A\_n79A like DC 21A n79A Qualcomm Inc.  R4-1910236 Draft CR of modification on reference to 38.101-2 requirements for inter-band EN-DC with FR2 for TS 38.101-3 NTT DOCOMO, INC.  R4-1910245 draft CR to correct band of band26 related EN-DC KDDI  R4-1910246 Draft CR to add simultaneous RX/TX capability requirements in R15 TS 38.101-3 CMCC  R4-1910248 Draft CR to TS 38.101-3 for DC\_38\_n78 mandatory simultaneous Rx/Tx capability Vodafone  R4-1910249 Draft CR for handling of EN-DC BCS for TS 38.101-3 NTT DOCOMO, INC.  R4-1910250 draftCR to 38.101-3 for missing IMD MSD for shared bands that already have MSD Qualcomm Inc.  R4-1910251 Draft CR for 38.101-3: non-contiguous resource allocation Huawei, HiSilicon  R4-1910255 Draft Minor Corrections to 38.101-3 clause 6.2B.4.1.1 Motorola Mobility, T‑Mobile USA  R4-1910256 draft CR for 38.101-3 specifying occupied bandwidth for intra-band non-contiguous EN-DC Huawei, HiSilicon  R4-1910257 Draft CR to TS 38.101-3: transmit intermodulation for intra-band EN‑DC ZTE Corporation  R4-1910268 Draft CR for TS 38.101-3: Corrections to reference sensitivity exceptions due to receiver harmonic mixing and cross band isolation for EN‑DC in NR FR1 MediaTek Inc.  R4-1910317 Draft CR for TS 38.101-3: Additional out-of-band blocking exceptions for inter-band EN-DC MediaTek Inc.  R4-1910318 Draft CR for 38.101-3: EN-DC Pcmax Huawei, HiSilicon  R4-1909111 Draft CR for 38.101-3 applicability for intra-band CA and ENDC Huawei, HiSilicon | 15.7.0 |
| 2019-12 | RAN#86 | RP-193032 | 0074 |  | F | CR for 38.101-3 EN-DC RX Out-of-Band Blocking for shared bands and bands in close proximity | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0076 |  | F | CR to 38.101-3 Missing Harmonic Mixing MSD for DC\_3\_n77/n78 | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0078 |  | F | CR for 38.101-3 EN-DC DL Synchronous Carriers | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0084 |  | F | CR for 38.101-3: Correction to DC Config and dual UL interferer (Rel-15) | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0086 |  | F | CR for 38.101-3: Correction to EN-DC and NE-DC Configurations (Rel-15) | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0088 | 1 | F | CR to 38.101-3: clarification of ENDC power class in R15 | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0089 | 1 | F | CR to TS38.101-3: Correction on channel spacing for intra-band EN-DC carriers (section 5.4B.1) | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0098 |  | F | CR to TS 38.101-3 on inter-band EN-DC configurations including FR2 for five bands (Rel-15) | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0103 |  | F | CR to TS 38.101-3 on inter-band CA, EN-DC, NE-DC and NR-DC configurations (Rel-15) | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0104 |  | F | CR to TS 38.101-3: clarification for MPR statement | 15.8.0 |
| 2019-12 | RAN#86 | RP-193032 | 0105 |  | F | CR for TS 38.101-3: Removing MSD requirements for EN-DC combinations due to receiver even order harmonic mixing with UL 3rd harmonic | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0110 |  | F | CR to TS 38.101-3: adding missing 90MHz channel BW support for n77, n78 related CA | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0113 |  | F | Removal of brackets from MPR and MSD 38.101-3 REL15 | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0119 |  | F | Pcmax for EN-DC: applicability of NS values and removal of a duty-cycle capability | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0124 |  | B | CR for TS 38.101-3: Additional out-of-band blocking exceptions for inter-band EN-DC | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0127 |  | F | CR for 38.101-3: correct MSD exception for DC\_2\_n78(Rel-15) | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0135 | 1 | F | CR for 38.101-3: Clarification of the notation for intra-band EN-DC combinations | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0137 |  | F | CR to 38.101-3-f70 Corrections to MSD Due to Cross-band Isolation for EN-DC in FR1 | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0141 |  | F | CR to 38.101-3 on only synchronous NR-DC between FR1 and FR2 support in Rel-15 | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0142 | 2 | F | CR for 38.101-3 Correction of EN-DC BCS | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0144 |  | F | CR for 38.101-3 correction for intra-band EN-DC Pcmax | 15.8.0 |
| 2019-12 | RAN#86 | RP-193033 | 0145 |  | F | CR for 38.101-3 intra-band EN-DC MPR/AMPR | 15.8.0 |
| 2020-03 | RAN#87 | RP-200396 | 0163 |  | F | CR for 38.101-3: Correction of MOP tolerance for B41/n41 EN-DC | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0171 |  | F | CR to TS 38.101-3: corrections on ACS for intra-band contiguous EN-DC | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0173 | 1 | D | CR to TS 38.101-3: editorial corrections on Rx requirements for intra-band contiguous EN-DC | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0176 | 1 | F | CR to TS 38.101-3: Correct the intra-band ENDC channel spacing | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0192 |  | F | CR to TS 38.101-3: editorial correction for output power dynamics for intra-band EN-DC | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0198 |  | F | CR on correction of 38.101-3 NEDC Ppowerclass (Rel-15) | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0209 | 1 | F | Rel-15 CR to 38.101-3 for editorial corrections | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0210 |  | F | CR to 38.101-3 R15 to remove FDM ULSUP combinations | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0212 |  | F | CR for inter-band ENDC Tx requirement\_Rel-15 | 15.9.0 |
| 2020-03 | RAN#87 | RP-200396 | 0216 | 1 | F | EN-DC configuration table corrections | 15.9.0 |
| 2020-06 | RAN#88 | RP-200985 | 0239 |  | F | CR for TS 38.101-3: MSD due to UL harmonic | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0244 |  | F | MOP for interband EN-DC including both FR1 and FR2 REL15 | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0258 |  | F | CR to TS 38.101-3 on configured output power relaxation due to EN-DC (Rel-15) | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0260 |  | F | CR to TS 38.101-3 on REFSENS relaxation due to EN-DC (Rel-15) | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0250 | 1 | F | CR for 38.101-3: Corrections for Ppowerclass and referenced sections | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0266 | 1 | F | CR to TS 38.101-3: Clean up the MSD test point for ENDC(three band) | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0231 | 1 | F | CR Coexistence cleanup for 38101-3 Rel15 | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0237 | 1 | F | CR for TS 38.101-3: Missing MSD due to cross band isolation | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0242 | 1 | F | FR1+FR2 CA interband CA BCS support REL15 | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0247 | 1 | B | CR to 38.101-3 MSD due to UL harmonics and intermodulation interference | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0233 | 1 | F | CR to TS 38.101-3 R15: corrections on ACS for intra-band contiguous EN-DC | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0235 | 1 | F | CR to TS 38.101-3: editorial corrections on wide band Intermodulation for intra-band contiguous EN-DC in FR1 | 15.10.0 |
| 2020-06 | RAN#88 | RP-200988 | 0295 |  | F | CR to remove TBD in 38.101-3 | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0271 | 2 | F | Removal of the Annex modifiedMPR-Behaviour from the NSA specification | 15.10.0 |
| 2020-06 | RAN#88 | RP-200985 | 0239 |  | F | CR for TS 38.101-3: MSD due to UL harmonic | 15.10.0 |
| 2020-09 | RAN#89 | RP-201512 | 0306 | 1 | F | CR for missing IMD MSD in 38.101-3 for DC\_1A-41A\_n78A, DC\_7A-28A\_n78A | 15.11.0 |
| 2020-09 | RAN#89 | RP-201512 | 0308 |  | F | Correction to in-band emissions for intra-band contiguous EN-DC | 15.11.0 |
| 2020-09 | RAN#89 | RP-201512 | 0316 | 2 | F | CR to 38.101-3 MSD due to UL harmonics and intermodulation interference | 15.11.0 |
| 2020-09 | RAN#89 | RP-201512 | 0318 |  | F | CR to correct protected band of intra-band EN-DC | 15.11.0 |
| 2020-09 | RAN#89 | RP-201512 | 0322 | 1 | F | CR for TS 38.101-3: FR1 inter-band EN-DC out-of-band blocking UL configuration | 15.11.0 |
| 2020-09 | RAN#89 | RP-201512 | 0325 | 1 | F | Corrections of Japan-related EN-DC co-ex tables for REL-15 combo | 15.11.0 |
| 2020-12 | RAN#90 | RP-202485 | 0369 |  | F | UL output power for spurious response and general Rx | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0384 | 1 | F | CR to TS 38.101-3: Some corrections on the ENDC | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0397 |  | F | CR to correct MSD of DC\_1A-41A\_n77A | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0399 |  | F | Correction of CR0325 implementation | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0409 | 1 | F | Correction of applicability of 2Rx requirements | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0411 | 1 | F | CR 38101-3 R15 Band 10 protection and DC\_42\_n79 correction | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0419 | 1 | F | CR for 38.101-3 Correction on EN-DC synchronous carriers (R15) | 15.12.0 |
| 2020-12 | RAN#90 | RP-202485 | 0423 | 1 | F | CR for TS 38.101-3: correction of spurious emission band UE co-existence (R15) | 15.12.0 |
| 2021-03 | RAN#91 | RP-210117 | 0474 | 1 | F | CR for 38.101-3 to introduce a new MSD due to the counter intermodulation interference(Rel-15) | 15.13.0 |
| 2021-03 | RAN#91 | RP-210117 | 0502 |  | F | CR for 38.101-3: clarification of intra-band EN-DC BCS applicability | 15.13.0 |
| 2021-03 | RAN#91 | RP-210851 | 0508 | 1 | F | Correcting FR1-FR2 BCS ambiguity – Interpretation B | 15.13.0 |
| 2021-06 | RAN#92-e | RP-211080 | 0514 | 1 | F | CR for clarification on interBandContiguousMRDC in TS 38.101-3 | 15.14.0 |
| 2021-06 | RAN#92-e | RP-211080 | 0517 | 1 | F | Corrections to EN-DC spurious emission tables | 15.14.0 |
| 2021-06 | RAN#92-e | RP-211086 | 0530 | - | F | CR to TS 38.101-3[R15]: Addition of UE co-existence requirements for band 40 and n40. | 15.14.0 |
| 2021-06 | RAN#92-e | RP-211080 | 0534 | 1 | F | Cleanup for UE co-existence 38.101-3 Rel-15 | 15.14.0 |
| 2021-06 | RAN#92-e | RP-211088 | 0572 |  | F | CR to TS38.101-3: Correction on TIB,c description for FR1-FR2 CA | 15.14.0 |
| 2021-09 | RAN#93-e | RP-211921 | 0430 | 3 | F | CR to 38.101-3 on handling of fallbacks for FR2 CA | 15.15.0 |
| 2021-09 | RAN#93-e | RP-211923 | 0636 |  | F | Big CR for TS 38.101-3 Maintenance part1 (Rel-15) | 15.15.0 |
| 2021-12 | RAN#94-e | RP-212854 | 0669 |  | F | Big CR for TS 38.101-3 Maintenance (Rel-15) | 15.16.0 |
| 2022-03 | RAN#95 | RP-220337 | 0700 |  | F | Big CR for TS 38.101-3 Maintenance (Rel-15) | 15.17.0 |
| 2022-06 | RAN#96 | RP-221655 | 0733 |  | F | Big CR for TS 38.101-3 Maintenance (Rel-15) | 15.18.0 |
| 2022-09 | RAN#97 | RP-222023 | 0750 |  | F | Big CR for 38.101-3 maintenance (Rel-15) | 15.19.0 |
| 2022-10 | RAN#97 |  |  |  |  | Editorial change | 15.19.1 |
| 2022-12 | RAN#98-e | RP-223291 | 0764 | 1 | F | CR for TS 38.101-3 on clarifications for intra-band EN-DC configurations | 15.20.0 |
| 2022-12 | RAN#98-e | RP-223290 | 0788 |  | F | CR to TS38.101-3[R15] 4Rx MSD for ENDC | 15.20.0 |
| 2022-12 | RAN#98-e | RP-223290 | 0797 |  | F | R15 CR on inter band ENDC OOBE correction | 15.20.0 |
| 2022-12 | RAN#98-e | RP-223291 | 0802 | 1 | F | CR on TDD RMC for Intra-band EN-DC - TS 38.101-3 | 15.20.0 |