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

## A.2.1 General

The measurement channels in the following subclauses 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.2.1.1 Applicability and common parameters

The UL reference measurement channels comprise transmission of PUSCH and Demodulation Reference signals only. The following conditions apply:

- 1 HARQ transmission

- Cyclic Prefix normal

- PUSCH hopping off

- Link adaptation off

- Demodulation Reference signal as per TS 36.211 [4] subclause 5.5.2.1.2.

Where ACK/NACK is transmitted, it is assumed to be multiplexed on PUSCH as per TS 36.212 [5] subclause 5.2.2.6.

- ACK/NACK 1 bit

- ACK/NACK mapping adjacent to Demodulation Reference symbol

- ACK/NACK resources punctured into data

- Max number of resources for ACK/NACK: 4 SC-FDMA symbols per subframe

- No CQI transmitted, no RI transmitted

### A.2.1.2 Determination of payload size

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 section 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 section 5.1.2 of TS 36.212 [5].

c) For RMC-s, which at the nominal target coding rate do not cover all the possible UE categories for the given modulation, reduce the target coding rate gradually (within the same modulation), until the maximal possible number of UE categories is covered.

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

### A.2.1.3 Overview of UL reference measurement channels

In Table A.2.1.3-1 to A.2.1.3-1K are listed the UL reference measurement channels specified in annexes A.2.2 and A.2.3 of this release of TS 36.101. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation’s parameters as to be used for requirements are annexes A.2.2 and A.2.3 as appropriate.

Table A.2.1.3-1: Overview of UL reference measurement channels (FDD, Full RB allocation, QPSK)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.1.1-1 |  | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.1-1 |  | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.1-1 |  | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.1-1 |  | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.1-1 |  | 15 | QPSK | 1/5 | 75 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.1-1 |  | 20 | QPSK | 1/6 | 100 |  | ≥ 1 |  |
| FDD / HD-FDD | Table A.2.2.1.1-1a |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.1-1a |  | 3 | QPSK | 1/5 | 15 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.1-1a |  | 5 | QPSK | 1/8 | 25 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.1-1a |  | 10 | QPSK | 1/10 | 36 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.1-1a |  | 15 | QPSK | 1/10 | 36 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.1-1a |  | 20 | QPSK | 1/10 | 36 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.1-1b |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.1-1b |  | 3 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.1-1b |  | 5 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.1-1b |  | 10 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.1-1b |  | 15 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.1-1b |  | 20 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.1-1c |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c |  | 3 | QPSK | 1/3 | 12 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c |  | 5 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c |  | 10 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c |  | 15 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c |  | 20 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |

Table A.2.1.3-1A: Overview of UL reference measurement channels (FDD, Full RB allocation, 16-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.1.2-1 |  | 1.4 | 16QAM | 3/4 | 6 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.2-1 |  | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.2-1 |  | 5 | 16QAM | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.2.2.1.2-1 |  | 10 | 16QAM | 3/4 | 50 |  | ≥ 2 |  |
| FDD | Table A.2.2.1.2-1 |  | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| FDD | Table A.2.2.1.2-1 |  | 20 | 16QAM | 1/3 | 100 |  | ≥ 2 |  |
| FDD / HD-FDD | Table A.2.2.1.2-1a |  | 1.4 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.2-1a |  | 3 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.2-1a |  | 5 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.2-1a |  | 10 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.2-1a |  | 15 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.2-1a |  | 20 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.1.2-1b |  | 1.4 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.2-1b |  | 3 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.2-1b |  | 5 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.2-1b |  | 10 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.2-1b |  | 15 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.2-1b |  | 20 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.1.2-1c |  | 1.4 | 16QAM | 1/3 | 6 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c |  | 3 | 16QAM | 1/3 | 12 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c |  | 5 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c |  | 10 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c |  | 15 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c |  | 20 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |

Table A.2.1.3-1B: Overview of UL reference measurement channels (FDD, Full RB allocation, 64-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.1.3-1 |  | 1.4 | 64QAM | 3/4 | 6 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 |  | 3 | 64QAM | 3/4 | 15 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 |  | 5 | 64QAM | 3/4 | 25 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 |  | 10 | 64QAM | 3/4 | 50 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 |  | 15 | 64QAM | 3/4 | 75 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 |  | 20 | 64QAM | 3/4 | 100 |  | 5,8 | UL category 5, 8, 13, 14 |

Table A.2.1.3-1Ba: Overview of UL reference measurement channels (FDD, Full RB allocation, 256-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.1.4-1 |  | 1.4 | 256QAM | 4/5 | 6 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.1.4-1 |  | 3 | 256QAM | 4/5 | 15 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.1.4-1 |  | 5 | 256QAM | 4/5 | 25 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.1.4-1 |  | 10 | 256QAM | 4/5 | 50 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.1.4-1 |  | 15 | 256QAM | 4/5 | 75 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.1.4-1 |  | 20 | 256QAM | 4/5 | 100 |  |  | UL category ≥ 15 |

Table A.2.1.3-1C: Overview of UL reference measurement channels (FDD, Partial RB allocation, QPSK)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 1 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 2 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 3 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 4 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 5 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 8 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 9 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 10 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 12 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 16 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 18 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 20 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 24 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 27 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 30 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 32 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 36 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 40 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 45 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 48 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 15 - 20 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 15 - 20 | QPSK | 1/3 | 54 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 15 - 20 | QPSK | 1/4 | 60 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 15 - 20 | QPSK | 1/4 | 64 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 15 - 20 | QPSK | 1/4 | 72 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 20 | QPSK | 1/5 | 75 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 20 | QPSK | 1/5 | 80 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 20 | QPSK | 1/5 | 81 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 20 | QPSK | 1/6 | 90 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.1-1 |  | 20 | QPSK | 1/6 | 96 |  | ≥ 1 |  |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 1 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 2 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 3 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 4 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 5 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 3-20 | QPSK | 1/3 | 6 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 3-20 | QPSK | 1/3 | 8 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 3-20 | QPSK | 1/3 | 9 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 3-20 | QPSK | 1/3 | 10 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 3-20 | QPSK | 1/4 | 12 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 5-20 | QPSK | 1/5 | 15 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 5-20 | QPSK | 1/5 | 16 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 5-20 | QPSK | 1/6 | 18 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 5-20 | QPSK | 1/6 | 20 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 5-20 | QPSK | 1/8 | 24 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 10-20 | QPSK | 1/8 | 25 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 10-20 | QPSK | 1/8 | 27 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1a |  | 10-20 | QPSK | 1/10 | 30 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 1 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 2 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 3 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 4 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 5 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.1-1b |  | 3-20 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 1 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 2 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 3 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 4 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 5 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 3-20 | QPSK | 1/3 | 6 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 3-20 | QPSK | 1/3 | 9 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 3-20 | QPSK | 1/3 | 12 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 5-20 | QPSK | 1/3 | 15 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 5-20 | QPSK | 1/3 | 18 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c |  | 5-20 | QPSK | 1/3 | 21 |  | - | UE UL category M2 |

Table A.2.1.3-1D: Overview of UL reference measurement channels (FDD, Partial RB allocation, 16-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 3 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 4 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 5 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 6 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 8 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 9 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 10 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 12 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 5 - 20 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 5 - 20 | 16QAM | 1/2 | 16 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 5 - 20 | 16QAM | 1/2 | 18 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 5 - 20 | 16QAM | 1/3 | 20 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 5 - 20 | 16QAM | 1/3 | 24 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 1/3 | 27 |  | ≥ 1 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 30 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 32 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 36 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 40 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 45 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 48 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 15 - 20 | 16QAM | 3/4 | 50 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 15 - 20 | 16QAM | 3/4 | 54 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 15 - 20 | 16QAM | 2/3 | 60 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 15 - 20 | 16QAM | 2/3 | 64 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 15 - 20 | 16QAM | 1/2 | 72 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 20 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 20 | 16QAM | 1/2 | 80 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 20 | 16QAM | 1/2 | 81 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 20 | 16QAM | 2/5 | 90 |  | ≥ 2 |  |
| FDD | Table A.2.2.2.2-1 |  | 20 | 16QAM | 2/5 | 96 |  | ≥ 2 |  |
| FDD / HD-FDD | Table A.2.2.2.2-1a |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.2-1a |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.2-1a |  | 1.4 - 20 | 16QAM | 2/5 | 4 |  | - | UE UL category 0 |
| FDD / HD-FDD | Table A.2.2.2.2-1b |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.2-1b |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.2-1b |  | 1.4 - 20 | 16QAM | 2/5 | 4 |  | - | UE UL category M1 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 1 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 2 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 3 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 4 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 5 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 3 - 20 | 16QAM | 1/2 | 6 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 3 - 20 | 16QAM | 1/2 | 9 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 3 - 20 | 16QAM | 1/2 | 12 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 15 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 18 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 21 |  | - | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 24 |  | - | UE UL category M2 |

Table A.2.1.3-1E: Overview of UL reference measurement channels (FDD, Partial RB allocation, 64-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 1 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 2 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 3 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 4 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 5 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 6 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 8 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 9 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 10 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 12 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 15 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 16 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 18 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 20 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 24 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 25 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 27 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 30 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 32 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 36 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 40 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 45 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 48 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 50 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 54 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 60 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 64 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 72 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 20 | 64QAM | 3/4 | 75 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 20 | 64QAM | 3/4 | 80 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 20 | 64QAM | 3/4 | 81 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 20 | 64QAM | 3/4 | 90 |  | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 |  | 20 | 64QAM | 3/4 | 96 |  | 5,8 | UL category 5, 8, 13, 14 |

Table A.2.1.3-1Ea: Overview of UL reference measurement channels (FDD, Partial RB allocation, 256-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.2.2.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 1 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 2 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 3 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 4 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 5 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 6 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 8 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 9 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 10 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 12 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 15 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 16 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 18 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 20 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 24 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 25 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 27 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 30 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 32 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 36 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 40 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 45 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 48 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 50 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 54 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 60 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 64 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 72 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 20 | 256QAM | 4/5 | 75 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 20 | 256QAM | 4/5 | 80 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 20 | 256QAM | 4/5 | 81 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 20 | 256QAM | 4/5 | 90 |  |  | UL category ≥ 15 |
| FDD | Table A.2.2.2.4-1 |  | 20 | 256QAM | 4/5 | 96 |  |  | UL category ≥ 15 |

Table A.2.1.3-1F: Overview of UL reference measurement channels (TDD, Full RB allocation, QPSK)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.1.1-1 |  | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.1-1 |  | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.1-1 |  | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.1-1 |  | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.1-1 |  | 15 | QPSK | 1/5 | 75 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.1-1 |  | 20 | QPSK | 1/6 | 100 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.1-1A |  | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A |  | 3 | QPSK | 1/3 | 15 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A |  | 5 | QPSK | 1/3 | 25 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A |  | 10 | QPSK | 1/3 | 50 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A |  | 15 | QPSK | 1/5 | 75 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A |  | 20 | QPSK | 1/6 | 100 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1a |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.1-1a |  | 3 | QPSK | 1/5 | 15 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.1-1a |  | 5 | QPSK | 1/8 | 25 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.1-1a |  | 10 | QPSK | 1/10 | 36 |  | - | UE UL category 0 |
| - | Table A.2.3.1.1-1a |  | 15 | QPSK | 1/10 | 36 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.1-1a |  | 20 | QPSK | 1/10 | 36 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.1-1b |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 3 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 5 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 10 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 15 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 20 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1c |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 3 | QPSK | 1/3 | 12 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 5 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 10 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 15 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 20 | QPSK | 1/3 | 24 |  | - | UE UL category M2 |

Table A.2.1.3-1G: Overview of UL reference measurement channels (TDD, Full RB allocation, 16-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.1.2-1 |  | 1.4 | 16QAM | 3/4 | 6 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.2-1 |  | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.2-1 |  | 5 | 16QAM | 1/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.2.3.1.2-1 |  | 10 | 16QAM | 3/4 | 50 |  | ≥ 2 |  |
| TDD | Table A.2.3.1.2-1 |  | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| TDD | Table A.2.3.1.2-1 |  | 20 | 16QAM | 1/3 | 100 |  | ≥ 2 |  |
| TDD | Table A.2.3.1.2-1A |  | 1.4 | 16QAM | 3/4 | 6 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A |  | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A |  | 5 | 16QAM | 1/3 | 25 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A |  | 10 | 16QAM | 3/4 | 50 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A |  | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A |  | 20 | 16QAM | 1/3 | 100 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1a |  | 1.4 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.2-1a |  | 3 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.2-1a |  | 5 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.2-1a |  | 10 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.2-1a |  | 15 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.2-1a |  | 20 | 16QAM | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.1.1-1b |  | 1.4 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 3 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 5 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 10 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 15 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b |  | 20 | 16QAM | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.1.1-1c |  | 1.4 | 16QAM | 1/3 | 6 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 3 | 16QAM | 1/3 | 12 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 5 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 10 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 15 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c |  | 20 | 16QAM | 1/3 | 24 |  | - | UE UL category M2 |

Table A.2.1.3-1H: Overview of UL reference measurement channels (TDD, Full RB allocation, 64-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.1.3-1 |  | 1.4 | 64QAM | 3/4 | 6 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 |  | 3 | 64QAM | 3/4 | 15 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 |  | 5 | 64QAM | 3/4 | 25 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 |  | 10 | 64QAM | 3/4 | 50 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 |  | 15 | 64QAM | 3/4 | 75 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 |  | 20 | 64QAM | 3/4 | 100 |  | 5,8 | UL category 5, 8, 13, 14 |

Table A.2.1.3-1Ha: Overview of UL reference measurement channels (TDD, Full RB allocation, 256-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.1.4-1 |  | 1.4 | 256QAM | 4/5 | 6 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.1.4-1 |  | 3 | 256QAM | 4/5 | 15 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.1.4-1 |  | 5 | 256QAM | 4/5 | 25 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.1.4-1 |  | 10 | 256QAM | 4/5 | 50 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.1.4-1 |  | 15 | 256QAM | 4/5 | 75 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.1.4-1 |  | 20 | 256QAM | 4/5 | 100 |  |  | UL category ≥ 15 |

Table A.2.1.3-1I: Overview of UL reference measurement channels (TDD, Partial RB allocation, QPSK)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 1 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 2 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 3 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 4 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 1.4 - 20 | QPSK | 1/3 | 5 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 8 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 9 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 10 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 3 - 20 | QPSK | 1/3 | 12 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 16 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 18 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 20 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 5 - 20 | QPSK | 1/3 | 24 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 27 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 30 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 32 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 36 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 40 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 45 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 10 - 20 | QPSK | 1/3 | 48 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 15 - 20 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 15 - 20 | QPSK | 1/3 | 54 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 15 - 20 | QPSK | 1/4 | 60 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 15 - 20 | QPSK | 1/4 | 64 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 15 - 20 | QPSK | 1/4 | 72 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 20 | QPSK | 1/5 | 75 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 20 | QPSK | 1/5 | 80 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 20 | QPSK | 1/5 | 81 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 20 | QPSK | 1/6 | 90 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1 |  | 20 | QPSK | 1/6 | 96 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.1-1A |  | 1.4 - 20 | QPSK | 1/3 | 1 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 1.4 - 20 | QPSK | 1/3 | 2 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 1.4 - 20 | QPSK | 1/3 | 3 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 1.4 - 20 | QPSK | 1/3 | 4 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 1.4 - 20 | QPSK | 1/3 | 5 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 3 - 20 | QPSK | 1/3 | 6 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 3 - 20 | QPSK | 1/3 | 8 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 3 - 20 | QPSK | 1/3 | 9 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 3 - 20 | QPSK | 1/3 | 10 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 3 - 20 | QPSK | 1/3 | 12 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 5 - 20 | QPSK | 1/3 | 15 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 5 - 20 | QPSK | 1/3 | 16 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 5 - 20 | QPSK | 1/3 | 18 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 5 - 20 | QPSK | 1/3 | 20 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 5 - 20 | QPSK | 1/3 | 24 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 25 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 27 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 30 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 32 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 36 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 40 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 45 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 10 - 20 | QPSK | 1/3 | 48 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 15 - 20 | QPSK | 1/3 | 50 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 15 - 20 | QPSK | 1/3 | 54 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 15 - 20 | QPSK | 1/4 | 60 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 15 - 20 | QPSK | 1/4 | 64 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 15 - 20 | QPSK | 1/4 | 72 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 20 | QPSK | 1/5 | 75 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 20 | QPSK | 1/5 | 80 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 20 | QPSK | 1/5 | 81 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 20 | QPSK | 1/6 | 90 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A |  | 20 | QPSK | 1/6 | 96 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 1 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 2 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 3 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 4 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 1.4 - 20 | QPSK | 1/3 | 5 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 3-20 | QPSK | 1/3 | 6 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 3-20 | QPSK | 1/3 | 8 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 3-20 | QPSK | 1/3 | 9 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 3-20 | QPSK | 1/3 | 10 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 3-20 | QPSK | 1/4 | 12 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 5-20 | QPSK | 1/5 | 15 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 5-20 | QPSK | 1/5 | 16 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 5-20 | QPSK | 1/6 | 18 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 5-20 | QPSK | 1/6 | 20 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 5-20 | QPSK | 1/8 | 24 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 10-20 | QPSK | 1/8 | 25 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 10-20 | QPSK | 1/8 | 27 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1a |  | 10-20 | QPSK | 1/10 | 30 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 1 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 2 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 3 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 4 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.1-1b |  | 1.4-20 | QPSK | 1/3 | 5 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.1-1b |  | 3-20 | QPSK | 1/3 | 6 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 1 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 2 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 3 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 4 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 1.4-20 | QPSK | 1/3 | 5 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 3-20 | QPSK | 1/3 | 6 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 3-20 | QPSK | 1/3 | 9 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 3-20 | QPSK | 1/3 | 12 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 5-20 | QPSK | 1/3 | 15 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 5-20 | QPSK | 1/3 | 18 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c |  | 5-20 | QPSK | 1/3 | 21 |  | - | UE UL category M2 |

Table A.2.1.3-1J: Overview of UL reference measurement channels (TDD, Partial RB allocation, 16-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 3 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 4 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 1.4 - 20 | 16QAM | 3/4 | 5 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 6 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 8 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 9 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 10 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 3 - 20 | 16QAM | 3/4 | 12 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 5 - 20 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 5 - 20 | 16QAM | 1/2 | 16 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 5 - 20 | 16QAM | 1/2 | 18 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 5 - 20 | 16QAM | 1/3 | 20 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 5 - 20 | 16QAM | 1/3 | 24 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 1/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 1/3 | 27 |  | ≥ 1 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 30 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 32 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 36 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 40 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 45 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 10 - 20 | 16QAM | 3/4 | 48 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 15 - 20 | 16QAM | 3/4 | 50 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 15 - 20 | 16QAM | 3/4 | 54 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 15 - 20 | 16QAM | 2/3 | 60 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 15 - 20 | 16QAM | 2/3 | 64 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 15 - 20 | 16QAM | 1/2 | 72 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 20 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 20 | 16QAM | 1/2 | 80 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 20 | 16QAM | 1/2 | 81 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 20 | 16QAM | 2/5 | 90 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1 |  | 20 | 16QAM | 2/5 | 96 |  | ≥ 2 |  |
| TDD | Table A.2.3.2.2-1A |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 1.4 - 20 | 16QAM | 3/4 | 3 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 1.4 - 20 | 16QAM | 3/4 | 4 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 1.4 - 20 | 16QAM | 3/4 | 5 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 3 - 20 | 16QAM | 3/4 | 6 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 3 - 20 | 16QAM | 3/4 | 8 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 3 - 20 | 16QAM | 3/4 | 9 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 3 - 20 | 16QAM | 3/4 | 10 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 3 - 20 | 16QAM | 3/4 | 12 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 5 - 20 | 16QAM | 1/2 | 15 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 5 - 20 | 16QAM | 1/2 | 16 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 5 - 20 | 16QAM | 1/2 | 18 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 5 - 20 | 16QAM | 1/3 | 20 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 5 - 20 | 16QAM | 1/3 | 24 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 1/3 | 25 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 1/3 | 27 |  | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 3/4 | 30 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 3/4 | 32 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 3/4 | 36 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 3/4 | 40 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 3/4 | 45 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 10 - 20 | 16QAM | 3/4 | 48 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 15 - 20 | 16QAM | 3/4 | 50 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 15 - 20 | 16QAM | 3/4 | 54 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 15 - 20 | 16QAM | 2/3 | 60 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 15 - 20 | 16QAM | 2/3 | 64 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 15 - 20 | 16QAM | 1/2 | 72 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 20 | 16QAM | 1/2 | 75 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 20 | 16QAM | 1/2 | 80 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 20 | 16QAM | 1/2 | 81 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 20 | 16QAM | 2/5 | 90 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A |  | 20 | 16QAM | 2/5 | 96 |  | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1a |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.2-1a |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.2-1a |  | 1.4 - 20 | 16QAM | 2/5 | 4 |  | - | UE UL category 0 |
| TDD | Table A.2.3.2.2-1b |  | 1.4 - 20 | 16QAM | 3/4 | 1 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.2-1b |  | 1.4 - 20 | 16QAM | 3/4 | 2 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.2-1b |  | 1.4 - 20 | 16QAM | 2/5 | 4 |  | - | UE UL category M1 |
| TDD | Table A.2.3.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 1 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 2 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 3 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 4 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 1.4 - 20 | 16QAM | 1/2 | 5 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 3 - 20 | 16QAM | 1/2 | 6 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 3 - 20 | 16QAM | 1/2 | 9 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 3 - 20 | 16QAM | 1/2 | 12 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 15 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 18 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 21 |  | - | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c |  | 5 - 20 | 16QAM | 1/2 | 24 |  | - | UE UL category M2 |

Table A.2.1.3-1K: Overview of UL reference measurement channels (TDD, Partial RB allocation, 64-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 1 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 2 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 3 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 4 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 1.4 - 20 | 64QAM | 3/4 | 5 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 6 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 8 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 9 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 10 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 3 - 20 | 64QAM | 3/4 | 12 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 15 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 16 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 18 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 20 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 5 - 20 | 64QAM | 3/4 | 24 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 25 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 27 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 30 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 32 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 36 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 40 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 45 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 10 - 20 | 64QAM | 3/4 | 48 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 50 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 54 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 60 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 64 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 15 - 20 | 64QAM | 3/4 | 72 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 20 | 64QAM | 3/4 | 75 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 20 | 64QAM | 3/4 | 80 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 20 | 64QAM | 3/4 | 81 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 20 | 64QAM | 3/4 | 90 |  | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 |  | 20 | 64QAM | 3/4 | 96 |  | 5,8 | UL category 5, 8, 13, 14 |

Table A.2.1.3-1Ka: Overview of UL reference measurement channels (TDD, Partial RB allocation, 256-QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.2.3.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 1 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 2 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 3 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 4 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 1.4 - 20 | 256QAM | 4/5 | 5 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 6 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 8 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 9 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 10 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 3 - 20 | 256QAM | 4/5 | 12 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 15 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 16 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 18 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 20 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 5 - 20 | 256QAM | 4/5 | 24 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 25 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 27 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 30 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 32 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 36 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 40 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 45 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 10 - 20 | 256QAM | 4/5 | 48 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 50 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 54 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 60 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 64 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 15 - 20 | 256QAM | 4/5 | 72 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 20 | 256QAM | 4/5 | 75 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 20 | 256QAM | 4/5 | 80 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 20 | 256QAM | 4/5 | 81 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 20 | 256QAM | 4/5 | 90 |  |  | UL category ≥ 15 |
| TDD | Table A.2.3.2.4-1 |  | 20 | 256QAM | 4/5 | 96 |  |  | UL category ≥ 15 |

Table A.2.1.3-1L: Overview of UL reference measurement channels (HD-FDD, NB-IoT, QPSK)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| HD-FDD | Table A.2.4-1 |  | 0.2 | π/2 BPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.2.4-1 |  | 0.2 | π/4 QPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.2.4-1 |  | 0.2 | π/2 BPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.2.4-1 |  | 0.2 | π/4 QPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.2.4-1 |  | 0.2 | QPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.2.4-1 |  | 0.2 | QPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.2.4-1 |  | 0.2 | QPSK | 1/3 | 1 |  | NB1 |  |

## A.2.2 Reference measurement channels for FDD

### 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 |
| 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 | 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame |  | 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) | | | | | | | |

Table A.2.2.1.1-1a: Reference Channels for QPSK with full/maximum RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 36 | 36 | 36 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate |  | 1/3 | 1/5 | 1/8 | 1/10 | 1/10 | 1/10 |
| Payload size | Bits | 600 | 872 | 904 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 4320 | 7200 | 10368 | 10368 | 10368 |
| Total symbols per Sub-Frame |  | 864 | 2160 | 3600 | 5184 | 5184 | 5184 |
| UE UL Category |  | 0 | 0 | 0 | 0 | 0 | 0 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

Table A.2.2.1.1-1b: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 6 | 6 | 6 | 6 | 6 |
| 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 | 1/3 | 1/3 |
| Payload size | Bits | 600 | 600 | 600 | 600 | 600 | 600 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 1728 | 1728 | 1728 | 1728 | 1728 |
| Total symbols per Sub-Frame |  | 864 | 864 | 864 | 864 | 864 | 864 |
| UE UL Category |  | M1 | M1 | M1 | M1 | M1 | M1 |
| 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: For HD-FDD UE with , the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled.  is total number of absolute subframes a PUSCH with repetition spans [4].  NOTE 3: For HD-FDD UE with , MPDCCH are scheduled at 0thDL subframe every +5 subframes (starting from the 0th subframe). The associated PUSCH is scheduled at the 4th to (+3)-th UL subframes every +5 subframes. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

Table A.2.2.1.1-1c: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 12 | 24 | 24 | 24 | 24 |
| 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 | 1/3 | 1/3 |
| Payload size | Bits | 600 | 1224 | 2472 | 2472 | 2472 | 2472 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 3456 | 6912 | 6912 | 6912 | 6912 |
| Total symbols per Sub-Frame |  | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE UL Category |  | M2 | M2 | M2 | M2 | M2 | M2 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

#### 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 |
| 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 | 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) |  | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame |  | 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) | | | | | | | |

Table A.2.2.1.2-1a: Reference Channels for 16-QAM with maximum RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 5 | 5 | 5 | 5 | 5 | 5 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame |  | 720 | 720 | 720 | 720 | 720 | 720 |
| UE UL Category |  | 0 | 0 | 0 | 0 | 0 | 0 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

Table A.2.2.1.2-1b: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 5 | 5 | 5 | 5 | 5 | 5 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame |  | 720 | 720 | 720 | 720 | 720 | 720 |
| UE Category |  | M1 | M1 | M1 | M1 | M1 | M1 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

Table A.2.2.1.2-1c: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 12 | 24 | 24 | 24 | 24 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 1032 | 2088 | 4264 | 4264 | 4264 | 4264 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 3456 | 6912 | 13824 | 13824 | 13824 | 13824 |
| Total symbols per Sub-Frame |  | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE Category |  | M2 | M2 | M2 | M2 | M2 | M2 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

#### 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 |
| 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 | 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) |  | 1 | 2 | 3 | 6 | 8 | 11 |
| Total number of bits per Sub-Frame | Bits | 5184 | 12960 | 21600 | 43200 | 64800 | 86400 |
| Total symbols per Sub-Frame |  | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category (Note 2) |  | 5,8 | 5,8 | 5,8 | 5,8 | 5,8 | 5,8 |
| UE UL Cateogry (Note 2) |  | 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)  Note2： 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 |
| 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 | 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) |  | 1 | 3 | 4 | 8 | 11 | 15 |
| Total number of bits per Sub-Frame | Bits | 6912 | 17280 | 28800 | 57600 | 86400 | 115200 |
| Total symbols per Sub-Frame |  | 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) | | | | | | | |

### A.2.2.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

#### 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 | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | ≥ 1 |
|  | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | ≥ 1 |
|  | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | ≥ 1 |
|  | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | ≥ 1 |
|  | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | ≥ 1 |
|  | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | ≥ 1 |
|  | 3-20 | 8 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | ≥ 1 |
|  | 3-20 | 9 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | ≥ 1 |
|  | 3-20 | 10 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
|  | 3-20 | 12 | 12 | QPSK | 1/3 | 1224 | 24 | 1 | 3456 | 1728 | ≥ 1 |
|  | 5-20 | 15 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | ≥ 1 |
|  | 5-20 | 16 | 12 | QPSK | 1/3 | 1384 | 24 | 1 | 4608 | 2304 | ≥ 1 |
|  | 5-20 | 18 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | ≥ 1 |
|  | 5-20 | 20 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
|  | 5-20 | 24 | 12 | QPSK | 1/3 | 2472 | 24 | 1 | 6912 | 3456 | ≥ 1 |
|  | 10-20 | 25 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 7200 | 3600 | ≥ 1 |
|  | 10-20 | 27 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 7776 | 3888 | ≥ 1 |
|  | 10-20 | 30 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
|  | 10-20 | 32 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 9216 | 4608 | ≥ 1 |
|  | 10-20 | 36 | 12 | QPSK | 1/3 | 3752 | 24 | 1 | 10368 | 5184 | ≥ 1 |
|  | 10-20 | 40 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
|  | 10-20 | 45 | 12 | QPSK | 1/3 | 4008 | 24 | 1 | 12960 | 6480 | ≥ 1 |
|  | 10-20 | 48 | 12 | QPSK | 1/3 | 4264 | 24 | 1 | 13824 | 6912 | ≥ 1 |
|  | 15 - 20 | 50 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
|  | 15 - 20 | 54 | 12 | QPSK | 1/3 | 4776 | 24 | 1 | 15552 | 7776 | ≥ 1 |
|  | 15 - 20 | 60 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
|  | 15 - 20 | 64 | 12 | QPSK | 1/4 | 4584 | 24 | 1 | 18432 | 9216 | ≥ 1 |
|  | 15 - 20 | 72 | 12 | QPSK | 1/4 | 5160 | 24 | 1 | 20736 | 10368 | ≥ 1 |
|  | 20 | 75 | 12 | QPSK | 1/5 | 4392 | 24 | 1 | 21600 | 10800 | ≥ 1 |
|  | 20 | 80 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
|  | 20 | 81 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23328 | 11664 | ≥ 1 |
|  | 20 | 90 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 1 |
|  | 20 | 96 | 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) | | | | | | | | | | | |

Table A.2.2.2.1-1a: Reference Channels for QPSK with partial RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE UL Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | 0 |
|  | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | 0 |
|  | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | 0 |
|  | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | 0 |
|  | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | 0 |
|  | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | 0 |
|  | 3-20 | 8 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | 0 |
|  | 3-20 | 9 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | 0 |
|  | 3-20 | 10 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | 0 |
|  | 3-20 | 12 | 12 | QPSK | 1/4 | 840 | 24 | 1 | 3456 | 1728 | 0 |
|  | 5-20 | 15 | 12 | QPSK | 1/5 | 872 | 24 | 1 | 4320 | 2160 | 0 |
|  | 5-20 | 16 | 12 | QPSK | 1/5 | 904 | 24 | 1 | 4608 | 2304 | 0 |
|  | 5-20 | 18 | 12 | QPSK | 1/6 | 776 | 24 | 1 | 5184 | 2592 | 0 |
|  | 5-20 | 20 | 12 | QPSK | 1/6 | 872 | 24 | 1 | 5760 | 2880 | 0 |
|  | 5-20 | 24 | 12 | QPSK | 1/8 | 872 | 24 | 1 | 6912 | 3456 | 0 |
|  | 10-20 | 25 | 12 | QPSK | 1/8 | 904 | 24 | 1 | 7200 | 3600 | 0 |
|  | 10-20 | 27 | 12 | QPSK | 1/8 | 968 | 24 | 1 | 7776 | 3888 | 0 |
|  | 10-20 | 30 | 12 | QPSK | 1/10 | 808 | 24 | 1 | 8640 | 4320 | 0 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

Table A.2.2.2.1-1b: Reference Channels for QPSK with partial RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M1 |
|  | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M1 |
|  | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M1 |
|  | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M1 |
|  | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M1 |
|  | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M1 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

Table A.2.2.2.1-1c: Reference Channels for QPSK with partial RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M2 |
|  | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M2 |
|  | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M2 |
|  | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M2 |
|  | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M2 |
|  | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M2 |
|  | 3-20 | 9 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | M2 |
|  | 3-20 | 12 | 12 | QPSK | 1/3 | 1032 | 24 | 1 | 3456 | 1728 | M2 |
|  | 5-20 | 15 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | M2 |
|  | 5-20 | 18 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | M2 |
|  | 5-20 | 21 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 6068 | 3024 | M2 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

#### A.2.2.2.2 16-QAM

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

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | ≥ 1 |
|  | 1.4 - 20 | 2 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | ≥ 1 |
|  | 1.4 - 20 | 3 | 12 | 16QAM | 3/4 | 1288 | 24 | 1 | 1728 | 432 | ≥ 1 |
|  | 1.4 - 20 | 4 | 12 | 16QAM | 3/4 | 1736 | 24 | 1 | 2304 | 576 | ≥ 1 |
|  | 1.4 - 20 | 5 | 12 | 16QAM | 3/4 | 2152 | 24 | 1 | 2880 | 720 | ≥ 1 |
|  | 3-20 | 6 | 12 | 16QAM | 3/4 | 2600 | 24 | 1 | 3456 | 864 | ≥ 1 |
|  | 3-20 | 8 | 12 | 16QAM | 3/4 | 3496 | 24 | 1 | 4608 | 1152 | ≥ 1 |
|  | 3-20 | 9 | 12 | 16QAM | 3/4 | 3880 | 24 | 1 | 5184 | 1296 | ≥ 1 |
|  | 3-20 | 10 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 1 |
|  | 3-20 | 12 | 12 | 16QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1728 | ≥ 1 |
|  | 5-20 | 15 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | ≥ 1 |
|  | 5-20 | 16 | 12 | 16QAM | 1/2 | 4584 | 24 | 1 | 9216 | 2304 | ≥ 1 |
|  | 5-20 | 18 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | ≥ 1 |
|  | 5-20 | 20 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 1 |
|  | 5-20 | 24 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 13824 | 3456 | ≥ 1 |
|  | 10-20 | 25 | 12 | 16QAM | 1/3 | 4968 | 24 | 1 | 14400 | 3600 | ≥ 1 |
|  | 10-20 | 27 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 15552 | 3888 | ≥ 1 |
|  | 10-20 | 30 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
|  | 10-20 | 32 | 12 | 16QAM | 3/4 | 13536 | 24 | 3 | 18432 | 4608 | ≥ 2 |
|  | 10-20 | 36 | 12 | 16QAM | 3/4 | 15264 | 24 | 3 | 20736 | 5184 | ≥ 2 |
|  | 10-20 | 40 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
|  | 10-20 | 45 | 12 | 16QAM | 3/4 | 19080 | 24 | 4 | 25920 | 6480 | ≥ 2 |
|  | 10-20 | 48 | 12 | 16QAM | 3/4 | 20616 | 24 | 4 | 27648 | 6912 | ≥ 2 |
|  | 15 - 20 | 50 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
|  | 15 - 20 | 54 | 12 | 16QAM | 3/4 | 22920 | 24 | 4 | 31104 | 7776 | ≥ 2 |
|  | 15 - 20 | 60 | 12 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |
|  | 15 - 20 | 64 | 12 | 16QAM | 2/3 | 25456 | 24 | 4 | 36864 | 9216 | ≥ 2 |
|  | 15 - 20 | 72 | 12 | 16QAM | 1/2 | 20616 | 24 | 4 | 41472 | 10368 | ≥ 2 |
|  | 20 | 75 | 12 | 16QAM | 1/2 | 21384 | 24 | 4 | 43200 | 10800 | ≥ 2 |
|  | 20 | 80 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
|  | 20 | 81 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46656 | 11664 | ≥ 2 |
|  | 20 | 90 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 2 |
|  | 20 | 96 | 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) | | | | | | | | | | | |

Table A.2.2.2.2-1a Reference Channels for 16-QAM with partial RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE UL Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | 0 |
|  | 1.4 - 20 | 2 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | 0 |
|  | 1.4 - 20 | 4 | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | 0 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

Table A.2.2.2.2-1b Reference Channels for 16-QAM with partial RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M1 |
|  | 1.4 - 20 | 2 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M1 |
|  | 1.4 - 20 | 3 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M1 |
|  | 1.4 - 20 | 4 | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | M1 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

Table A.2.2.2.2-1c Reference Channels for 16-QAM with partial RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M2 |
|  | 1.4 - 20 | 2 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M2 |
|  | 1.4 - 20 | 3 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M2 |
|  | 1.4 - 20 | 4 | 12 | 16QAM | 1/2 | 1128 | 24 | 1 | 2304 | 576 | M2 |
|  | 1.4 - 20 | 5 | 12 | 16QAM | 1/2 | 1416 | 24 | 1 | 2880 | 720 | M2 |
|  | 3 - 20 | 6 | 12 | 16QAM | 1/2 | 1736 | 24 | 1 | 3456 | 864 | M2 |
|  | 3 - 20 | 9 | 12 | 16QAM | 1/2 | 2600 | 24 | 1 | 5184 | 1296 | M2 |
|  | 3 - 20 | 12 | 12 | 16QAM | 1/2 | 3496 | 24 | 1 | 6912 | 1728 | M2 |
|  | 5 - 20 | 15 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | M2 |
|  | 5 - 20 | 18 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | M2 |
|  | 5 - 20 | 21 | 12 | 16QAM | 1/2 | 5992 | 24 | 1 | 12096 | 3024 | M2 |
|  | 5 - 20 | 24 | 12 | 16QAM | 1/2 | 6968 | 24 | 2 | 13824 | 3456 | M2 |
| 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: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD , the uplink subframes are scheduled at the 5th, 6th, and 7th subframes every 10msfor the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

#### 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 | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category (Note 2) | UE UL Cateogry (Note 2) |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |  |
|  | 1.4 - 20 | 1 | 12 | 64QAM | 3/4 | 616 | 24 | 1 | 864 | 144 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 2 | 12 | 64QAM | 3/4 | 1256 | 24 | 1 | 1728 | 288 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 3 | 12 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 4 | 12 | 64QAM | 3/4 | 2536 | 24 | 1 | 3456 | 576 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 5 | 12 | 64QAM | 3/4 | 3112 | 24 | 1 | 4320 | 720 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 6 | 12 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 8 | 12 | 64QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1152 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 9 | 12 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 10 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 12 | 12 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 15 | 12 | 64QAM | 3/4 | 9528 | 24 | 2 | 12960 | 2160 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 16 | 12 | 64QAM | 3/4 | 10296 | 24 | 2 | 13824 | 2304 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 18 | 12 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 20 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 24 | 12 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 25 | 12 | 64QAM | 3/4 | 15840 | 24 | 3 | 21600 | 3600 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 27 | 12 | 64QAM | 3/4 | 16992 | 24 | 3 | 23328 | 3888 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 30 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 32 | 12 | 64QAM | 3/4 | 20616 | 24 | 4 | 27648 | 4608 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 36 | 12 | 64QAM | 3/4 | 22920 | 24 | 4 | 31104 | 5184 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 40 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 45 | 12 | 64QAM | 3/4 | 28336 | 24 | 5 | 38880 | 6480 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 48 | 12 | 64QAM | 3/4 | 30576 | 24 | 5 | 41472 | 6912 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 50 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 54 | 12 | 64QAM | 3/4 | 34008 | 24 | 6 | 46656 | 7776 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 60 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 64 | 12 | 64QAM | 3/4 | 40576 | 24 | 7 | 55296 | 9216 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 72 | 12 | 64QAM | 3/4 | 45352 | 24 | 8 | 62208 | 10368 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 75 | 12 | 64QAM | 3/4 | 46888 | 24 | 8 | 64800 | 10800 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 80 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 81 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69984 | 11664 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 90 | 12 | 64QAM | 2/3 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 96 | 12 | 64QAM | 3/4 | 61664 | 24 | 11 | 82944 | 13824 | 5,8 | 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)  Note2： 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 | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE UL Cateogry |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 12 | 256QAM | 3/4 | 840 | 24 | 1 | 1152 | 144 | ≥ 15 |
|  | 1.4 - 20 | 2 | 12 | 256QAM | 3/4 | 1672 | 24 | 1 | 2304 | 288 | ≥ 15 |
|  | 1.4 - 20 | 3 | 12 | 256QAM | 3/4 | 2536 | 24 | 1 | 3456 | 432 | ≥ 15 |
|  | 1.4 - 20 | 4 | 12 | 256QAM | 3/4 | 3368 | 24 | 1 | 4608 | 576 | ≥ 15 |
|  | 1.4 - 20 | 5 | 12 | 256QAM | 3/4 | 4264 | 24 | 1 | 5760 | 720 | ≥ 15 |
|  | 3-20 | 6 | 12 | 256QAM | 3/4 | 5160 | 24 | 1 | 6912 | 864 | ≥ 15 |
|  | 3-20 | 8 | 12 | 256QAM | 3/4 | 6712 | 24 | 2 | 9216 | 1152 | ≥ 15 |
|  | 3-20 | 9 | 12 | 256QAM | 3/4 | 7736 | 24 | 2 | 10368 | 1296 | ≥ 15 |
|  | 3-20 | 10 | 12 | 256QAM | 3/4 | 8504 | 24 | 2 | 11520 | 1440 | ≥ 15 |
|  | 3-20 | 12 | 12 | 256QAM | 3/4 | 10296 | 24 | 2 | 13824 | 1728 | ≥ 15 |
|  | 5-20 | 15 | 12 | 256QAM | 3/4 | 12960 | 24 | 3 | 17280 | 2160 | ≥ 15 |
|  | 5-20 | 16 | 12 | 256QAM | 3/4 | 13536 | 24 | 3 | 18432 | 2304 | ≥ 15 |
|  | 5-20 | 18 | 12 | 256QAM | 3/4 | 15264 | 24 | 3 | 20736 | 2592 | ≥ 15 |
|  | 5-20 | 20 | 12 | 256QAM | 3/4 | 16992 | 24 | 3 | 23040 | 2880 | ≥ 15 |
|  | 5-20 | 24 | 12 | 256QAM | 3/4 | 20616 | 24 | 4 | 27648 | 3456 | ≥ 15 |
|  | 10-20 | 25 | 12 | 256QAM | 3/4 | 21384 | 24 | 4 | 28800 | 3600 | ≥ 15 |
|  | 10-20 | 27 | 12 | 256QAM | 3/4 | 22920 | 24 | 4 | 31104 | 3888 | ≥ 15 |
|  | 10-20 | 30 | 12 | 256QAM | 3/4 | 25456 | 24 | 5 | 34560 | 4320 | ≥ 15 |
|  | 10-20 | 32 | 12 | 256QAM | 3/4 | 27376 | 24 | 5 | 36864 | 4608 | ≥ 15 |
|  | 10-20 | 36 | 12 | 256QAM | 3/4 | 30576 | 24 | 6 | 41472 | 5184 | ≥ 15 |
|  | 10-20 | 40 | 12 | 256QAM | 3/4 | 34008 | 24 | 6 | 46080 | 5760 | ≥ 15 |
|  | 10-20 | 45 | 12 | 256QAM | 3/4 | 37888 | 24 | 7 | 51840 | 6480 | ≥ 15 |
|  | 10-20 | 48 | 12 | 256QAM | 3/4 | 40576 | 24 | 8 | 55296 | 6912 | ≥ 15 |
|  | 15 - 20 | 50 | 12 | 256QAM | 3/4 | 42368 | 24 | 8 | 57600 | 7200 | ≥ 15 |
|  | 15 - 20 | 54 | 12 | 256QAM | 3/4 | 46888 | 24 | 8 | 62208 | 7776 | ≥ 15 |
|  | 15 - 20 | 60 | 12 | 256QAM | 3/4 | 51024 | 24 | 9 | 69120 | 8640 | ≥ 15 |
|  | 15 - 20 | 64 | 12 | 256QAM | 3/4 | 55056 | 24 | 9 | 73728 | 9216 | ≥ 15 |
|  | 15 - 20 | 72 | 12 | 256QAM | 3/4 | 61664 | 24 | 11 | 82944 | 10368 | ≥ 15 |
|  | 20 | 75 | 12 | 256QAM | 3/4 | 63776 | 24 | 11 | 86400 | 10800 | ≥ 15 |
|  | 20 | 80 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 92160 | 11520 | ≥ 15 |
|  | 20 | 81 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 93312 | 11664 | ≥ 15 |
|  | 20 | 90 | 12 | 256QAM | 3/4 | 76208 | 24 | 13 | 103680 | 12960 | ≥ 15 |
|  | 20 | 96 | 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) | | | | | | | | | | | |

### A.2.2.3 Void

Table A.2.2.3-1: Void

### A.2.2.4 subPRB allocation

The location of allocated RB for subPRB allocation is chosen according to values specified in the Tx requirements.

**Table A.2.2.4-1: Reference Channels for SubPRB allocation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Channel bandwidth | MHz | 1.4 – 20 | 1.4 – 20 | 1.4 – 20 |
| Allocated resource blocks |  | 1 | 1 | 1 |
| Number of subcarriers |  | 2 out of 3 | 3 | 6 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 |
| Modulation |  | π/2 BPSK | QPSK | QPSK |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 32 | 72 | 72 |
| Transport block CRC | Bits | 24 | 24 | 24 |
| Number of code blocks |  | 1 | 1 | 1 |
| Total number of bits per resource unit | Bits | 192 | 288 | 288 |
| Total symbols per resource unit |  | 192 | 144 | 144 |
| Tx time | ms | 8 | 4 | 2 |
| UE UL Category |  | M1/M2 | M1/M2 | M1/M2 |
| 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) | | | | |

## A.2.3 Reference measurement channels for TDD

For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL:2UL. or 1DL:4UL. 2DL:2UL is the default and used unless explicitly specified in the test case

### A.2.3.1 Full RB allocation

#### A.2.3.1.1 QPSK

Table A.2.3.1.1-1: 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 2,3,7,8 | 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 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 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 [4] | | | | | | | |

Table A.2.3.1.1-1A: Reference Channels for QPSK with full RB allocation, UL-DL configuration 0

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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) |  | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 2,3,4,7,8,9 | 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,4,7,8,9 | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,4,7,8,9 |  | 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 [4] | | | | | | | |

Table A.2.3.1.1-1a: Reference Channels for QPSK with full/maximum RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 36 | 36 | 36 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate |  | 1/3 | 1/5 | 1/8 | 1/10 | 1/10 | 1/10 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 872 | 904 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 4320 | 7200 | 10368 | 10368 | 10368 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 864 | 2160 | 3600 | 5184 | 5184 | 5184 |
| UE UL Category |  | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 | | | | | | | |

Table A.2.3.1.1-1b: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 6 | 6 | 6 | 6 | 6 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 1/3 | 1/3 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 600 | 600 | 600 | 600 | 600 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 1728 | 1728 | 1728 | 1728 | 1728 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 864 | 864 | 864 | 864 | 864 | 864 |
| UE UL Category |  | M1 | M1 | M1 | M1 | M1 | M1 |
| 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 | | | | | | | |

Table A.2.3.1.1-1c: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 12 | 24 | 24 | 24 | 24 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 1/3 | 1/3 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 1224 | 2472 | 2472 | 2472 | 2472 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 3456 | 6912 | 6912 | 6912 | 6912 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE UL Category |  | M2 | M2 | M2 | M2 | M2 | M2 |
| 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 | | | | | | | |

#### A.2.3.1.2 16-QAM

Table A.2.3.1.2-1: 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 2,3,7,8 | 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 2,3,7,8 |  | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 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 [4] | | | | | | | |

Table A.2.3.1.2-1A: Reference Channels for 16-QAM with full RB allocation, UL-DL configuration 0

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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) |  | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 2,3,4,7,8,9 | Bits | 2600 | 4264 | 4968 | 21384 | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks - C |  | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,4,7,8,9 | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,4,7,8,9 |  | 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 [4] | | | | | | | |

Table A.2.3.1.2-1a: Reference Channels for 16-QAM with maximum RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 5 | 5 | 5 | 5 | 5 | 5 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 720 | 720 | 720 | 720 | 720 | 720 |
| UE UL Category |  | 0 | 0 | 0 | 0 | 0 | 0 |
| 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[4] | | | | | | | |

Table A.2.3.1.2-1b: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 5 | 5 | 5 | 5 | 5 | 5 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 720 | 720 | 720 | 720 | 720 | 720 |
| UE Category |  | M1 | M1 | M1 | M1 | M1 | M1 |
| 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[4] | | | | | | | |

Table A.2.3.1.2-1c: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 12 | 24 | 24 | 24 | 24 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 1032 | 2088 | 4264 | 4264 | 4264 | 4264 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 3456 | 6912 | 13824 | 13824 | 13824 | 13824 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE Category |  | M2 | M2 | M2 | M2 | M2 | M2 |
| 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[4] | | | | | | | |

#### A.2.3.1.3 64-QAM

Table A.2.3.1.3-1: 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 2,3,7,8 | 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 2,3,7,8 |  | 1 | 2 | 3 | 6 | 8 | 11 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 5184 | 12960 | 21600 | 43200 | 64800 | 86400 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category (Note 3) |  | 5, 8 | 5, 8 | 5, 8 | 5, 8 | 5, 8 | 5, 8 |
| UE UL Cateogry (Note 3) |  | 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 [4]  Note 3: 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.2.3.1.4 256 QAM

Table A.2.3.1.4-1: 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 2,3,7,8 | 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 2,3,7,8 |  | 1 | 3 | 4 | 8 | 11 | 15 |
| Total number of bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 | Bits | 6912 | 17280 | 28800 | 57600 | 86400 | 115200 |
| Total symbols per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 2,3,7,8 |  | 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 [4] | | | | | | | |

### A.2.3.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

#### A.2.3.2.1 QPSK

Table A.2.3.2.1-1: Reference Channels for QPSK with partial RB allocation

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

Table A.2.3.2.1-1A: Reference Channels for QPSK with partial RB allocation, UL-DL configuration 0

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

Table A.2.3.2.1-1a: Reference Channels for QPSK with partial RB allocation for UE UL category 0

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE UL Category |
| Unit | MHz |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | 0 |
|  | 1.4 - 20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | 0 |
|  | 1.4 - 20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | 0 |
|  | 1.4 - 20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | 0 |
|  | 1.4 - 20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | 0 |
|  | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | 0 |
|  | 3-20 | 8 | 1 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | 0 |
|  | 3-20 | 9 | 1 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | 0 |
|  | 3-20 | 10 | 1 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | 0 |
|  | 3-20 | 12 | 1 | 12 | QPSK | 1/4 | 840 | 24 | 1 | 3456 | 1728 | 0 |
|  | 5-20 | 15 | 1 | 12 | QPSK | 1/5 | 872 | 24 | 1 | 4320 | 2160 | 0 |
|  | 5-20 | 16 | 1 | 12 | QPSK | 1/5 | 904 | 24 | 1 | 4608 | 2304 | 0 |
|  | 5-20 | 18 | 1 | 12 | QPSK | 1/6 | 776 | 24 | 1 | 5184 | 2592 | 0 |
|  | 5-20 | 20 | 1 | 12 | QPSK | 1/6 | 872 | 24 | 1 | 5760 | 2880 | 0 |
|  | 5-20 | 24 | 1 | 12 | QPSK | 1/8 | 872 | 24 | 1 | 6912 | 3456 | 0 |
|  | 10-20 | 25 | 1 | 12 | QPSK | 1/8 | 904 | 24 | 1 | 7200 | 3600 | 0 |
|  | 10-20 | 27 | 1 | 12 | QPSK | 1/8 | 968 | 24 | 1 | 7776 | 3888 | 0 |
|  | 10-20 | 30 | 1 | 12 | QPSK | 1/10 | 808 | 24 | 1 | 8640 | 4320 | 0 |
| 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 [4] | | | | | | | | | | | | |

Table A.2.3.2.1-1b: Reference Channels for QPSK with partial RB allocation for UE UL category M1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
| Unit | MHz |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M1 |
|  | 1.4 - 20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M1 |
|  | 1.4 - 20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M1 |
|  | 1.4 - 20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M1 |
|  | 1.4 - 20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M1 |
|  | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M1 |
| 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 [4]. | | | | | | | | | | | | |

Table A.2.3.2.1-1c: Reference Channels for QPSK with partial RB allocation for UE UL category M2

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
| Unit | MHz |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M2 |
|  | 1.4 - 20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M2 |
|  | 1.4 - 20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M2 |
|  | 1.4 - 20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M2 |
|  | 1.4 - 20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M2 |
|  | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M2 |
|  | 3-20 | 9 | 1 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | M2 |
|  | 3-20 | 12 | 1 | 12 | QPSK | 1/3 | 1032 | 24 | 1 | 3456 | 1728 | M2 |
|  | 5-20 | 15 | 1 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | M2 |
|  | 5-20 | 18 | 1 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | M2 |
|  | 5-20 | 21 | 1 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 6068 | 3024 | M2 |
| 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 [4]. | | | | | | | | | | | | |

#### A.2.3.2.2 16-QAM

Table A.2.3.2.2-1: Reference Channels for 16QAM with partial RB allocation

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

Table A.2.3.2.2-1A: Reference Channels for 16-QAM with partial RB allocation, UL-DL configuration 0

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

Table A.2.3.2.2-1a: Reference Channels for 16QAM with partial RB allocation UE UL category 0

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE UL Category |
| Unit | MHz |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | 0 |
|  | 1.4 - 20 | 2 |  | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | 0 |
|  | 1.4 - 20 | 4 |  | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | 0 |
| 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 [4] | | | | | | | | | | | | |

Table A.2.3.2.2-1b: Reference Channels for 16QAM with partial RB allocation UE UL category M1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
| Unit | MHz |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M1 |
|  | 1.4 - 20 | 2 | 1 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M1 |
|  | 1.4 - 20 | 3 | 1 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M1 |
|  | 1.4 - 20 | 4 | 1 | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | M1 |
| 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 [4]. | | | | | | | | | | | | |

Table A.2.3.2.2-1c: Reference Channels for 16QAM with partial RB allocation UE UL category M2

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
| Unit | MHz |  |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 1.4 - 20 | 1 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M2 |
|  | 1.4 - 20 | 2 | 1 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M2 |
|  | 1.4 - 20 | 3 | 1 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M2 |
|  | 1.4 - 20 | 4 | 1 | 12 | 16QAM | 1/2 | 1128 | 24 | 1 | 2304 | 576 | M2 |
|  | 1.4 - 20 | 5 | 1 | 12 | 16QAM | 1/2 | 1416 | 24 | 1 | 2880 | 720 | M2 |
|  | 3 - 20 | 6 | 1 | 12 | 16QAM | 1/2 | 1736 | 24 | 1 | 3456 | 864 | M2 |
|  | 3 - 20 | 9 | 1 | 12 | 16QAM | 1/2 | 2600 | 24 | 1 | 5184 | 1296 | M2 |
|  | 3 - 20 | 12 | 1 | 12 | 16QAM | 1/2 | 3496 | 24 | 1 | 6912 | 1728 | M2 |
|  | 5 - 20 | 15 | 1 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | M2 |
|  | 5 - 20 | 18 | 1 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | M2 |
|  | 5 - 20 | 21 | 1 | 12 | 16QAM | 1/2 | 5992 | 24 | 1 | 12096 | 3024 | M2 |
|  | 5 - 20 | 24 | 1 | 12 | 16QAM | 1/2 | 6968 | 24 | 2 | 13824 | 3456 | M2 |
| 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 [4]. | | | | | | | | | | | | |

#### A.2.3.2.3 64-QAM

Table A.2.3.2.3-1: Reference Channels for 64-QAM with partial RB allocation

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category (Note 3) | UE UL Cateogry (Note 3) |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |  |
|  | 1.4 - 20 | 1 | 12 | 64QAM | 3/4 | 616 | 24 | 1 | 864 | 144 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 2 | 12 | 64QAM | 3/4 | 1256 | 24 | 1 | 1728 | 288 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 3 | 12 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 4 | 12 | 64QAM | 3/4 | 2536 | 24 | 1 | 3456 | 576 | 5,8 | 5, 8, 13, 14 |
|  | 1.4 - 20 | 5 | 12 | 64QAM | 3/4 | 3112 | 24 | 1 | 4320 | 720 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 6 | 12 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 8 | 12 | 64QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1152 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 9 | 12 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 10 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 | 5, 8, 13, 14 |
|  | 3-20 | 12 | 12 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 15 | 12 | 64QAM | 3/4 | 9528 | 24 | 2 | 12960 | 2160 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 16 | 12 | 64QAM | 3/4 | 10296 | 24 | 2 | 13824 | 2304 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 18 | 12 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 20 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 | 5, 8, 13, 14 |
|  | 5-20 | 24 | 12 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 25 | 12 | 64QAM | 3/4 | 15840 | 24 | 3 | 21600 | 3600 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 27 | 12 | 64QAM | 3/4 | 16992 | 24 | 3 | 23328 | 3888 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 30 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 32 | 12 | 64QAM | 3/4 | 20616 | 24 | 4 | 27648 | 4608 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 36 | 12 | 64QAM | 3/4 | 22920 | 24 | 4 | 31104 | 5184 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 40 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 45 | 12 | 64QAM | 3/4 | 28336 | 24 | 5 | 38880 | 6480 | 5,8 | 5, 8, 13, 14 |
|  | 10-20 | 48 | 12 | 64QAM | 3/4 | 30576 | 24 | 5 | 41472 | 6912 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 50 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 54 | 12 | 64QAM | 3/4 | 34008 | 24 | 6 | 46656 | 7776 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 60 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 64 | 12 | 64QAM | 3/4 | 40576 | 24 | 7 | 55296 | 9216 | 5,8 | 5, 8, 13, 14 |
|  | 15 - 20 | 72 | 12 | 64QAM | 3/4 | 45352 | 24 | 8 | 62208 | 10368 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 75 | 12 | 64QAM | 3/4 | 46888 | 24 | 8 | 64800 | 10800 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 80 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 81 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69984 | 11664 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 90 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 96 | 12 | 64QAM | 3/4 | 61664 | 24 | 11 | 82944 | 13824 | 5,8 | 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 [4].  Note 3: 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.2.3.2.4 256 QAM

Table A.2.3.2.4-1: Reference Channels for 256 QAM with partial RB allocation

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

### A.2.3.3 Void

Table A.2.3.3-1: Void

### A.2.3.4 subPRB allocation

The location of allocated RB for subPRB allocation is chosen according to values specified in the Tx requirements.

**Table A.2.3.4-1: Reference Channels for SubPRB allocation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Channel bandwidth | MHz | 1.4 – 20 | 1.4 – 20 | 1.4 – 20 |
| Allocated resource blocks |  | 1 | 1 | 1 |
| Number of subcarriers |  | 2 out of 3 | 3 | 6 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 | 12 |
| Modulation |  | π/2 BPSK | QPSK | QPSK |
| Target Coding rate |  | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 32 | 72 | 72 |
| Transport block CRC | Bits | 24 | 24 | 24 |
| Number of code blocks |  | 1 | 1 | 1 |
| Total number of bits per resource unit | Bits | 192 | 288 | 288 |
| Total symbols per resource unit |  | 192 | 144 | 144 |
| Tx time | ms | 8 | 4 | 2 |
| UE UL Category |  | M1/M2 | M1/M2 | M1/M2 |
| 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) | | | | |

## A.2.4 Reference measurement channels for UE category NB1

Table A.2.4-1 Reference Channels for UE category NB1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Value | | | | | | |
| Sub-carrier spacing (kHz) | 3.75 | 3.75 | 15 | 15 | 15 | 15 | 15 |
| Number of tone | 1 | 1 | 1 | 1 | 3 | 6 | 12 |
| Modulation | π/2 BPSK | π/4 QPSK | π/2 BPSK | π/4 QPSK | QPSK | QPSK | QPSK |
| Number of NPUSCH repetition (NOTE 5) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| IMCS / ITBS | 0 / 0 | 3 / 3 | 0 / 0 | 3 / 3 | 5 / 5 | 5 / 5 | 5 / 5 |
| Payload size (bits) | 32 | 40 | 32 | 40 | 72 | 72 | 72 |
| Allocated resource unit | 2 | 1 | 2 | 1 | 1 | 1 | 1 |
| Code rate (target) | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Code rate (effective) | 0.29 | 0.33 | 0.29 | 0.33 | 0.33 | 0.33 | 0.33 |
| Transport block CRC (bits) | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Code block CRC size (bits) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of code blocks – C | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per resource unit | 96 | 192 | 96 | 192 | 288 | 288 | 288 |
| Total symbols per resource unit | 96 | 96 | 96 | 96 | 144 | 144 | 144 |
| Tx time (ms) | 64 | 32 | 16 | 8 | 4 | 2 | 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: Parameters related to NPUSCH format 1 scheduling are defined in Table A.2.4-2.  NOTE 3: NPDCCH is not transmitted in the subframes used for transmission of SI messages.  NOTE 4: SI messages transmission should be prioritized over NPDCCH transmission in case of collision. NPDCCH transmission is postponed until the next NB-IoT downlink subframe in case NPDCCH transmission occurs in a non NB-IoT downlink subframe, where an NB-IoT downlink subframe is a subframe that does not contain NPSS/NSSS/NPBCH/SIB1-NB transmission.  NOTE 5: Number of repetition NRep as defined in table 16.5.1.1-3 in TS 36.213 [6]. | | | | | | | |

Table A.2.4-2: NPDCCH configuration for NPUSCH format 1 scheduling

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| DCI format |  | DCI format N0 |
| NPDCCH format |  | 1 |
| Scheduling delay () |  | 0 |
| DCI subframe repetition number |  | 00 |
| (*npdcch-NumRepetitions*) |  | 1 |
| G  (*NPDCCH-startSF-USS*) |  | 8 |
| (*npdcch-Offset-USS*) |  | 1/4 |

## A.2.5 Reference measurement channels for LAA

### A.2.5.1 Full RB allocation

#### A.2.5.1.1 QPSK

Table A.2.5.1.1-1: Reference Channels for QPSK with full RB allocation

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Channel bandwidth | MHz | 10 | 20 |
| Allocated resource blocks |  | 50 | 100 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 |
| Modulation |  | QPSK | QPSK |
| Target Coding rate |  | 1/3 | 1/6 |
| Payload size | Bits | 5160 | 4584 |
| Transport block CRC | Bits | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 14400 | 28800 |
| Total symbols per Sub-Frame |  | 7200 | 14400 |
| UE Category |  | ≥ 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) | | | |

#### A.2.5.1.2 16QAM

Table A.2.5.1.2-1: Reference Channels for 16QAM with full RB allocation

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Channel bandwidth | MHz | 10 | 20 |
| Allocated resource blocks |  | 50 | 100 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 |
| Modulation |  | 16QAM | 16QAM |
| Target Coding rate |  | 3/4 | 1/3 |
| Payload size | Bits | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  | 4 | 4 |
| Total number of bits per Sub-Frame | Bits | 28800 | 57600 |
| Total symbols per Sub-Frame |  | 7200 | 14400 |
| UE Category |  | ≥ 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) | | | |

#### A.2.5.1.3 64QAM

Table A.2.5.1.3-1: Reference Channels for 64QAM with full RB allocation

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Channel bandwidth | MHz | 10 | 20 |
| Allocated resource blocks |  | 50 | 100 |
| DFT-OFDM Symbols per Sub-Frame |  | 12 | 12 |
| Modulation |  | 64QAM | 64QAM |
| Target Coding rate |  | 3/4 | 3/4 |
| Payload size | Bits | 31704 | 63776 |
| Transport block CRC | Bits | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) |  | 8 | 11 |
| Total number of bits per Sub-Frame | Bits | 43200 | 86400 |
| Total symbols per Sub-Frame |  | 7200 | 14400 |
| UE Category (Note 2) |  | 5,8 | 5,8 |
| UE UL Category (Note 2) |  | 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: 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.2.5.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements.

#### A.2.5.2.1 QPSK

Table A.2.5.2.1-1: Reference Channels for QPSK with partial RB allocation

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 10 - 20 | 10 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
|  | 10 - 20 | 20 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
|  | 10 - 20 | 30 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
|  | 10 - 20 | 40 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
|  | 20 | 50 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
|  | 20 | 60 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
|  | 20 | 70 | 12 | QPSK | 1/4 | 4968 | 24 | 1 | 20160 | 10080 | ≥ 1 |
|  | 20 | 80 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
|  | 20 | 90 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 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: For the channel bandwidth of 10Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+5, N+10, …, N+45 for N = 0, …, NInterlace-1 } where NInterlace is 1, …, 4 for the allocated RBs of 10, …, 40, respectively.  Note 3: For the channel bandwidth of 20Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+10, N+20, …, N+90 for N = 0, …, NInterlace-1 } where NInterlace is 1, .., 9 for the allocated RBs of 10, …, 90, respectively. | | | | | | | | | | | |

#### A.2.5.2.2 16QAM

Table A.2.5.2.2-1: Reference Channels for 16QAM with partial RB allocation

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |
|  | 10 - 20 | 10 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 2 |
|  | 10 - 20 | 20 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 2 |
|  | 10 - 20 | 30 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
|  | 10 - 20 | 40 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
|  | 20 | 50 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
|  | 20 | 60 | 12 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |
|  | 20 | 70 | 12 | 16QAM | 1/2 | 19848 | 24 | 4 | 40320 | 10080 | ≥ 2 |
|  | 20 | 80 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
|  | 20 | 90 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 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: For the channel bandwidth of 10Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+5, N+10, …, N+45 for N = 0, …, NInterlace-1 } where NInterlace is 1, …, 4 for the allocated RBs of 10, …, 40, respectively.  Note 3: For the channel bandwidth of 20Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+10, N+20, …, N+90 for N = 0, …, NInterlace-1 } where NInterlace is 1, .., 9 for the allocated RBs of 10, …, 90, respectively. | | | | | | | | | | | |

#### A.2.5.2.3 64QAM

Table A.2.5.2.3-1: Reference Channels for 64QAM with partial RB allocation

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category  (Note 2) | UE UL Category  (Note 2) |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |  |  |
|  | 10 - 20 | 10 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 | 5, 8, 13, 14 |
|  | 10 - 20 | 20 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 | 5, 8, 13, 14 |
|  | 10 - 20 | 30 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 | 5, 8, 13, 14 |
|  | 10 - 20 | 40 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 50 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 60 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 70 | 12 | 64QAM | 3/4 | 43816 | 24 | 4 | 60480 | 10080 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 80 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 | 5, 8, 13, 14 |
|  | 20 | 90 | 12 | 64QAM | 2/3 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 | 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: 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  Note 3: For the channel bandwidth of 10Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+5, N+10, …, N+45 for N = 0, …, NInterlace-1 } where NInterlace is 1, …, 4 for the allocated RBs of 10, …, 40, respectively.  Note 4: For the channel bandwidth of 20Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+10, N+20, …, N+90 for N = 0, …, NInterlace-1 } where NInterlace is 1, .., 9 for the allocated RBs of 10, …, 90, respectively. | | | | | | | | | | | | |

# A.3 DL reference measurement channels

## 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 section 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 section 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 2DL+DwPTS (12 OFDM symbol): 2UL

### A.3.1.1 Overview of DL reference measurement channels

In Table A.3.1.1-1 to A.3.1.1-1V are listed the DL reference measurement channels specified in annexes A.3.2 to A.3.15 of this release of TS 36.101. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation’s parameters as to be used for requirements are annexes A.3.2 to A.3.15 as appropriate.

Table A.3.1.1-1: Overview of DL reference measurement channels (FDD, Receiver requirements)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.3.2-1 |  | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.2-1 |  | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| FDD | Table A.3.2-1 |  | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.2-1 |  | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.2-1 |  | 15 | QPSK | 1/3 | 75 |  | ≥ 1 |  |
| FDD | Table A.3.2-1 |  | 20 | QPSK | 1/3 | 100 |  | ≥ 1 |  |
| FDD / HD-FDD | Table A.3.2-1a |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE DL Category 0 |
| FDD / HD-FDD | Table A.3.2-1a |  | 3 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| FDD / HD-FDD | Table A.3.2-1a |  | 5 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| FDD / HD-FDD | Table A.3.2-1a |  | 10 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| FDD / HD-FDD | Table A.3.2-1a |  | 15 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| FDD / HD-FDD | Table A.3.2-1a |  | 20 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| FDD / HD-FDD | Table A.3.2-1b |  | 1.4 | QPSK | 1/3 | 4 |  | M1 |  |
| FDD / HD-FDD | Table A.3.2-1b |  | 3 | QPSK | 1/3 | 4 |  | M1 |  |
| FDD / HD-FDD | Table A.3.2-1b |  | 5 | QPSK | 1/3 | 4 |  | M1 |  |
| FDD / HD-FDD | Table A.3.2-1b |  | 10 | QPSK | 1/3 | 4 |  | M1 |  |
| FDD / HD-FDD | Table A.3.2-1b |  | 15 | QPSK | 1/3 | 4 |  | M1 |  |
| FDD / HD-FDD | Table A.3.2-1b |  | 20 | QPSK | 1/3 | 4 |  | M1 |  |
| HD-FDD | Table A.3.2-1c |  | 0.2 | QPSK | 1/3 | 1 |  | NB1 |  |
| HD-FDD | Table A.3.2-1d |  | 0.2 | QPSK | 1/3 | 1 |  | NB1 |  |
| FDD / HD-FDD | Table A.3.2-1h |  | 1.4 | QPSK | 1/3 | 4 |  | M2 |  |
| FDD / HD-FDD | Table A.3.2-1h |  | 3 | QPSK | 1/3 | 8 |  | M2 |  |
| FDD / HD-FDD | Table A.3.2-1h |  | 5 | QPSK | 1/3 | 16 |  | M2 |  |
| FDD / HD-FDD | Table A.3.2-1h |  | 10 | QPSK | 1/3 | 16 |  | M2 |  |
| FDD / HD-FDD | Table A.3.2-1h |  | 15 | QPSK | 1/3 | 16 |  | M2 |  |
| FDD / HD-FDD | Table A.3.2-1h |  | 20 | QPSK | 1/3 | 16 |  | M2 |  |

Table A.3.1.1-1A: Overview of DL reference measurement channels (TDD, Receiver requirements)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.3.2-2 |  | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.2-2 |  | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| TDD | Table A.3.2-2 |  | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.2-2 |  | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.2-2 |  | 15 | QPSK | 1/3 | 75 |  | ≥ 1 |  |
| TDD | Table A.3.2-2 |  | 20 | QPSK | 1/3 | 100 |  | ≥ 1 |  |
| TDD | Table A.3.2-2a |  | 1.4 | QPSK | 1/3 | 6 |  | - | UE DL Category 0 |
| TDD | Table A.3.2-2a |  | 3 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| TDD | Table A.3.2-2a |  | 5 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| TDD | Table A.3.2-2a |  | 10 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| TDD | Table A.3.2-2a |  | 15 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| - | Table A.3.2-2a |  | 20 | QPSK | 1/3 | 14 |  | - | UE DL Category 0 |
| TDD Band 46 | Table A.3.2-2c |  | 20 | QPSK | 1/3 | 100 |  | ≥ 3 |  |
| TDD | Table A.3.2-2b |  | 1.4 | QPSK | 1/3 | 4 |  | M1 |  |
| TDD | Table A.3.2-2b |  | 3 | QPSK | 1/3 | 4 |  | M1 |  |
| TDD | Table A.3.2-2b |  | 5 | QPSK | 1/3 | 4 |  | M1 |  |
| TDD | Table A.3.2-2b |  | 10 | QPSK | 1/3 | 4 |  | M1 |  |
| TDD | Table A.3.2-2b |  | 15 | QPSK | 1/3 | 4 |  | M1 |  |
| TDD | Table A.3.2-2b |  | 20 | QPSK | 1/3 | 4 |  | M1 |  |
| TDD | Table A.3.2-2d |  | 1.4 | QPSK | 1/3 | 4 |  | M2 |  |
| TDD | Table A.3.2-2d |  | 3 | QPSK | 1/3 | 8 |  | M2 |  |
| TDD | Table A.3.2-2d |  | 5 | QPSK | 1/3 | 16 |  | M2 |  |
| TDD | Table A.3.2-2d |  | 10 | QPSK | 1/3 | 16 |  | M2 |  |
| TDD | Table A.3.2-2d |  | 15 | QPSK | 1/3 | 16 |  | M2 |  |
| TDD | Table A.3.2-2d |  | 20 | QPSK | 1/3 | 16 |  | M2 |  |

Table A.3.1.1-1B: Overview of DL reference measurement channels (FDD, Receiver requirements, Maximum input level)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| UE Categories ≥ 3 | | | | | | | | | |
| FDD | Table A.3.2-3 |  | 1.4 | 64QAM | 3/4 | 6 |  | - |  |
| FDD | Table A.3.2-3 |  | 3 | 64QAM | 3/4 | 15 |  | - |  |
| FDD | Table A.3.2-3 |  | 5 | 64QAM | 3/4 | 25 |  | - |  |
| FDD | Table A.3.2-3 |  | 10 | 64QAM | 3/4 | 50 |  | - |  |
| FDD | Table A.3.2-3 |  | 15 | 64QAM | 3/4 | 75 |  | - |  |
| FDD | Table A.3.2-3 |  | 20 | 64QAM | 3/4 | 100 |  | - |  |
| UE Category 1 | | | | | | | | | |
| FDD | Table A.3.2-3a |  | 1.4 | 64QAM | 3/4 | 6 |  | - |  |
| FDD | Table A.3.2-3a |  | 3 | 64QAM | 3/4 | 15 |  | - |  |
| FDD | Table A.3.2-3a |  | 5 | 64QAM | 3/4 | 18 |  | - |  |
| FDD | Table A.3.2-3a |  | 10 | 64QAM | 3/4 | 17 |  | - |  |
| FDD | Table A.3.2-3a |  | 15 | 64QAM | 3/4 | 17 |  | - |  |
| FDD | Table A.3.2-3a |  | 20 | 64QAM | 3/4 | 17 |  | - |  |
| UE Category 2 | | | | | | | | | |
| FDD | Table A.3.2-3b |  | 1.4 | 64QAM | 3/4 | 6 |  | - |  |
| FDD | Table A.3.2-3b |  | 3 | 64QAM | 3/4 | 15 |  | - |  |
| FDD | Table A.3.2-3b |  | 5 | 64QAM | 3/4 | 25 |  | - |  |
| FDD | Table A.3.2-3b |  | 10 | 64QAM | 3/4 | 50 |  | - |  |
| FDD | Table A.3.2-3b |  | 15 | 64QAM | 3/4 | 75 |  | - |  |
| FDD | Table A.3.2-3b |  | 20 | 64QAM | 3/4 | 83 |  | - |  |
| UE DL Category 0 | | | | | | | | | |
| FDD | Table A.3.2-3c |  | 1.4 | 64QAM | 3/4 | 2 |  | - |  |
| FDD | Table A.3.2-3c |  | 3 | 64QAM | 3/4 | 2 |  | - |  |
| FDD | Table A.3.2-3c |  | 5 | 64QAM | 3/4 | 2 |  | - |  |
| FDD | Table A.3.2-3c |  | 10 | 64QAM | 3/4 | 2 |  | - |  |
| FDD | Table A.3.2-3c |  | 15 | 64QAM | 3/4 | 2 |  | - |  |
| FDD | Table A.3.2-3c |  | 20 | 64QAM | 3/4 | 2 |  | - |  |
| UE Categories 11/12 and UE DL categories ≥ 11 | | | | | | | | | |
| FDD | Table A.3.2-5 |  | 1.4 | 256QAM | 4/5 | 6 |  | - |  |
| FDD | Table A.3.2-5 |  | 3 | 256QAM | 4/5 | 15 |  | - |  |
| FDD | Table A.3.2-5 |  | 5 | 256QAM | 4/5 | 25 |  | - |  |
| FDD | Table A.3.2-5 |  | 10 | 256QAM | 4/5 | 50 |  | - |  |
| FDD | Table A.3.2-5 |  | 15 | 256QAM | 4/5 | 75 |  | - |  |
| FDD | Table A.3.2-5 |  | 20 | 256QAM | 4/5 | 100 |  | - |  |
| UE DL Category M1 | | | | | | | | | |
| FDD/HD-FDD | Table A.3.2-3d |  | 1.4 | 16QAM | 3/5 | 2 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3d |  | 3 | 16QAM | 3/5 | 2 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3d |  | 5 | 16QAM | 3/5 | 2 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3d |  | 10 | 16QAM | 3/5 | 2 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3d |  | 15 | 16QAM | 3/5 | 2 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3d |  | 20 | 16QAM | 3/5 | 2 |  | - |  |
| UE DL Category M2 | | | | | | | | | |
| FDD/HD-FDD | Table A.3.2-3e |  | 1.4 | 16QAM | 3/5 | 2 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3e |  | 3 | 16QAM | 3/5 | 8 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3e |  | 5 | 16QAM | 1/2 | 15 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3e |  | 10 | 16QAM | 1/2 | 15 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3e |  | 15 | 16QAM | 1/2 | 15 |  | - |  |
| FDD/HD-FDD | Table A.3.2-3e |  | 20 | 16QAM | 1/2 | 15 |  | - |  |
| UE DL category 20 and UE DL categories ≥ 22 | | | | | | | | | |
| FDD | Table A.3.2-8 |  | 1.4 | 1024QAM | 4/5 | 6 |  | - |  |
| FDD | Table A.3.2-8 |  | 3 | 1024QAM | 4/5 | 15 |  | - |  |
| FDD | Table A.3.2-8 |  | 5 | 1024QAM | 4/5 | 25 |  | - |  |
| FDD | Table A.3.2-8 |  | 10 | 1024QAM | 4/5 | 50 |  | - |  |
| FDD | Table A.3.2-8 |  | 15 | 1024QAM | 4/5 | 75 |  | - |  |
| FDD | Table A.3.2-8 |  | 20 | 1024QAM | 4/5 | 100 |  | - |  |

Table A.3.1.1-1C: Overview of DL reference measurement channels (TDD, Receiver requirements, Maximum input level)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| UE Categories ≥ 3 | | | | | | | | | |
| TDD | Table A.3.2-4 |  | 1.4 | 64QAM | 3/4 | 6 |  | - |  |
| TDD | Table A.3.2-4 |  | 3 | 64QAM | 3/4 | 15 |  | - |  |
| TDD | Table A.3.2-4 |  | 5 | 64QAM | 3/4 | 25 |  | - |  |
| TDD | Table A.3.2-4 |  | 10 | 64QAM | 3/4 | 50 |  | - |  |
| TDD | Table A.3.2-4 |  | 15 | 64QAM | 3/4 | 75 |  | - |  |
| TDD | Table A.3.2-4 |  | 20 | 64QAM | 3/4 | 100 |  | - |  |
| TDD Band 46 | Table A.3.2-4d |  | 20 | 64QAM | 3/4 | 100 |  | - |  |
| UE Category 1 | | | | | | | | | |
| TDD | Table A.3.2-4a |  | 1.4 | 64QAM | 3/4 | 6 |  | - |  |
| TDD | Table A.3.2-4a |  | 3 | 64QAM | 3/4 | 15 |  | - |  |
| TDD | Table A.3.2-4a |  | 5 | 64QAM | 3/4 | 18 |  | - |  |
| TDD | Table A.3.2-4a |  | 10 | 64QAM | 3/4 | 17 |  | - |  |
| TDD | Table A.3.2-4a |  | 15 | 64QAM | 3/4 | 17 |  | - |  |
| TDD | Table A.3.2-4a |  | 20 | 64QAM | 3/4 | 17 |  | - |  |
| UE Category 2 | | | | | | | | | |
| TDD | Table A.3.2-4b |  | 1.4 | 64QAM | 3/4 | 6 |  | - |  |
| TDD | Table A.3.2-4b |  | 3 | 64QAM | 3/4 | 15 |  | - |  |
| TDD | Table A.3.2-4b |  | 5 | 64QAM | 3/4 | 25 |  | - |  |
| TDD | Table A.3.2-4b |  | 10 | 64QAM | 3/4 | 50 |  | - |  |
| TDD | Table A.3.2-4b |  | 15 | 64QAM | 3/4 | 75 |  | - |  |
| TDD | Table A.3.2-4b |  | 20 | 64QAM | 3/4 | 83 |  | - |  |
| UE DL Category 0 | | | | | | | | | |
| TDD | Table A.3.2-4c |  | 1.4 | 64QAM | 3/4 | 2 |  | - |  |
| TDD | Table A.3.2-4c |  | 3 | 64QAM | 3/4 | 2 |  | - |  |
| TDD | Table A.3.2-4c |  | 5 | 64QAM | 3/4 | 2 |  | - |  |
| TDD | Table A.3.2-4c |  | 10 | 64QAM | 3/4 | 2 |  | - |  |
| TDD | Table A.3.2-4c |  | 15 | 64QAM | 3/4 | 2 |  | - |  |
| TDD | Table A.3.2-4c |  | 20 | 64QAM | 3/4 | 2 |  | - |  |
| UE Categories 11/12 and UE DL categories ≥ 11 | | | | | | | | | |
| TDD | Table A.3.2-6 |  | 1.4 | 256QAM | 4/5 | 6 |  | - |  |
| TDD | Table A.3.2-6 |  | 3 | 256QAM | 4/5 | 15 |  | - |  |
| TDD | Table A.3.2-6 |  | 5 | 256QAM | 4/5 | 25 |  | - |  |
| TDD | Table A.3.2-6 |  | 10 | 256QAM | 4/5 | 50 |  | - |  |
| TDD | Table A.3.2-6 |  | 15 | 256QAM | 4/5 | 75 |  | - |  |
| TDD | Table A.3.2-6 |  | 20 | 256QAM | 4/5 | 100 |  | - |  |
| TDD Band 46 | Table A.3.2-7 |  | 20 | 256QAM | 4/5 | 100 |  | - |  |
| **UE DL Category M1** | | | | | | | | | |
| TDD | Table A.3.2-4e |  | 1.4 | 16QAM | 3/5 | 2 |  | - |  |
| TDD | Table A.3.2-4e |  | 3 | 16QAM | 3/5 | 2 |  | - |  |
| TDD | Table A.3.2-4e |  | 5 | 16QAM | 3/5 | 2 |  | - |  |
| TDD | Table A.3.2-4e |  | 10 | 16QAM | 3/5 | 2 |  | - |  |
| TDD | Table A.3.2-4e |  | 15 | 16QAM | 3/5 | 2 |  | - |  |
| TDD | Table A.3.2-4e |  | 20 | 16QAM | 3/5 | 2 |  | - |  |
| **UE DL Category M2** | | | | | | | | | |
| TDD | Table A.3.2-4f |  | 1.4 | 16QAM | 3/5 | 2 |  | - |  |
| TDD | Table A.3.2-4f |  | 3 | 16QAM | 3/5 | 8 |  | - |  |
| TDD | Table A.3.2-4f |  | 5 | 16QAM | 1/2 | 15 |  | - |  |
| TDD | Table A.3.2-4f |  | 10 | 16QAM | 1/2 | 15 |  | - |  |
| TDD | Table A.3.2-4f |  | 15 | 16QAM | 1/2 | 15 |  | - |  |
| TDD | Table A.3.2-4f |  | 20 | 16QAM | 1/2 | 15 |  | - |  |
| UE DL category 20 and UE DL categories ≥ 22 | | | | | | | | | |
| TDD | Table A.3.2-9 |  | 1.4 | 1024QAM | 4/5 | 6 |  | - |  |
| TDD | Table A.3.2-9 |  | 3 | 1024QAM | 4/5 | 15 |  | - |  |
| TDD | Table A.3.2-9 |  | 5 | 1024QAM | 4/5 | 25 |  | - |  |
| TDD | Table A.3.2-9 |  | 10 | 1024QAM | 4/5 | 50 |  | - |  |
| TDD | Table A.3.2-9 |  | 15 | 1024QAM | 4/5 | 75 |  | - |  |
| TDD | Table A.3.2-9 |  | 20 | 1024QAM | 4/5 | 100 |  | - |  |
| TDD Band 46 | Table A.3.2-10 |  | 20 | 1024QAM | 4/5 | 100 |  | - |  |

Table A.3.1.1-1D: Overview of DL reference measurement channels (FDD, PDSCH Performance, Single-antenna transmission (CRS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | Table A.3.3.1-1 | R.4 FDD | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-1 | R.42 FDD | 20 | QPSK | 1/3 | 100 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-1 | R.42-1 FDD | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-1 | R.42-2 FDD | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-1 | R.42-3 FDD | 15 | QPSK | 1/3 | 75 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-1 | R.2 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-2 | R.3-1 FDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-2 | R.3 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.1-3 | R.5 FDD | 3 | 64QAM | 3/4 | 15 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-3 | R.6 FDD | 5 | 64QAM | 3/4 | 25 |  | ≥ 2 |  |
| FDD | Table A.3.3.1-3 | R.7 FDD | 10 | 64QAM | 3/4 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.1-3 | R.8 FDD | 15 | 64QAM | 3/4 | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.1-3 | R.9 FDD | 20 | 64QAM | 3/4 | 100 |  | ≥ 3 |  |
| FDD | Table A.3.3.1-3a | R.6-1 FDD | 5 | 64QAM | 3/4 | 18 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-3a | R.7-1 FDD | 10 | 64QAM | 3/4 | 17 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-3a | R.8-1 FDD | 15 | 64QAM | 3/4 | 17 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-3a | R.9-1 FDD | 20 | 64QAM | 3/4 | 17 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-3a | R.9-2 FDD | 20 | 64QAM | 3/4 | 83 |  | ≥ 2 |  |
| FDD | Table A.3.3.1-6 | R.41 FDD | 10 | QPSK | 1/10 | 50 |  | ≥ 1 |  |
| Single PRB (Channel edge) | | | | | | | | | |
| FDD | Table A.3.3.1-4 | R.0 FDD | 3 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| FDD | Table A.3.3.1-4 | R.1 FDD | 10 / 20 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| Single PRB (MBSFN Configuration) | | | | | | | | | |
| FDD | Table A.3.3.1-5 | R.29 FDD | 10 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |

Table A.3.1.1-1E: Overview of DL reference measurement channels (PDSCH Performance: Carrier aggregation with power imbalance)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.3.1-7 | R.49 FDD | 20 | 64QAM | 0.84-0.87 | 100 |  | ≥ 5 |  |
| FDD | Table A.3.3.1-7 | R.49-1 FDD | 10 | 64QAM | 0.84-0.87 | 50 |  | ≥2 |  |
| FDD | Table A.3.3.1-7 | R.49-2 FDD | 5 | 64QAM | 0.84-0.86 | 25 |  | ≥2 |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.4.1-7 | R.49 TDD | 20 | 64QAM | 0.81-087 | 100 |  | ≥ 5 |  |
| TDD | Table A.3.4.1-7 | R.49-1 TDD | 15 | 64QAM | 0.80-0.86 | 75 |  | ≥ 3 |  |

Table A.3.1.1-1F: Overview of DL reference measurement channels (FDD, PDSCH Performance, Multi-antenna transmission (CRS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| Two antenna ports | | | | | | | | | |
| FDD | Table A.3.3.2.1-1 | R.10 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-1 | R.11 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.11-1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.11-2 FDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-1 | R.11-3 FDD | 10 | 16QAM | 1/2 | 40 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-1 | R.11-4 FDD | 10 | QPSK | 1/2 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-9 | R.11-13 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.30 FDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.30-1 FDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.35 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.35-1 FDD | 20 | 64QAM | 0.39 | 100 |  | 4 |  |
| FDD | Table A.3.3.2.1-1 | R.35-2 FDD | 15 | 64QAM | 0.39 | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-1 | R.35-3 FDD | 10 | 64QAM | 0.39 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-2 | R.35-4 FDD | 10 | 64QAM | 0.47 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-2 | R.46 FDD | 10 | QPSK |  | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.47 FDD | 10 | 16QAM |  | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-7 | R.47-1 FDD | 5 | 16QAM |  | 25 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-7 | R.47-2 FDD | 15 | 16QAM |  | 75 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-7 | R.47-3 FDD | 20 | 16QAM |  | 100 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.11-5 FDD | 1.4 | 16QAM | 1/2 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.11-6 FDD | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.11-7 FDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-2 | R.11-8 FDD | 10 | QPSK | 3/5 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-2 | R.11-9 FDD | 10 | QPSK | 0.58 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.11-10 FDD | 10 | QPSK | 0.67 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.10-2 FDD | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-2 | R.10-3 FDD | 10 | 16QAM | 0.58 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-2 | R.65 FDD | 10 | 256QAM | 0.55 | 50 |  | 11-15 |  |
| FDD | Table A.3.3.2.1-3 | R.62 FDD | 10 | 16QAM | 1/2 | 3 |  | 0 |  |
| FDD | Table A.3.3.2.1-3 | R.63 FDD | 10 | 64QAM | 1/2 | 1 |  | 0 |  |
| FDD | Table A.3.3.2.1-4 | R.79 FDD | 10 | 16QAM | 1/2 | 3 |  | M1, M2,≥ 0 |  |
| FDD | Table A.3.3.2.1-5 | R.81 FDD | 10 | QPSK | 1/10 | 6 |  | M1, ≥ 0 |  |
| FDD | Table A.3.3.2.1-6 | R.84 FDD | 10 | 16QAM | 1/2 | 39 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-6 | R.aa FDD | 10 | QPSK | 0.6-0.65 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.1-6 | R.bb FDD | 10 | 16QAM | 0.3-0.32 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.1-6 | R.87 FDD | 10 | 64QAM | 0.39 | 50 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-6 | R.87-1 FDD | 10 | 16QAM | 0.44 | 50 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-6 | R.87-2 FDD | 5 | 64QAM | 0.39 | 25 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-6 | R.87-3 FDD | 15 | 64QAM | 0.39 | 75 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-6 | R.87-4 FDD | 20 | 64QAM | 0.39 | 100 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-8 | R.90 FDD | 10 | QPSK | 1/3 | 18 |  | M2 |  |
| FDD | Table A.3.3.2.1-8 | R.91 FDD | 10 | QPSK | 1/10 | 18 |  | M2 |  |
| FDD | Table A.3.3.2.1-8 | R.92-1 FDD | 10 | QPSK | 1/2 | 36 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-8 | R.92-2 FDD | 10 | QPSK | 1/2 | 36 |  | ≥1 |  |
| FDD | Table A.3.3.2.1-4 | R.103 FDD | 10 | QPSK | 1/3 | 3 |  | M1, M2 |  |
| FDD | Table A.3.3.2.1-4 | R.104 FDD | 10 | 64QAM | 0.4 | 3 |  | M1, M2 |  |
| Four antenna ports | | | | | | | | | |
| FDD | Table A.3.3.2.2-1 | R.12 FDD | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.13 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.14 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.2-1 | R.14-1 FDD | 10 | 16QAM | 1/2 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.14-2 FDD | 10 | 16QAM | 1/2 | 3 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.14-3 FDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.2-1 | R.36 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.2-1 | R.14-4 FDD | 1.4 | 16QAM | 1/2 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.14-5 FDD | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.14-6 FDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-1 | R.14-7 FDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.2.2-2 | R.72 FDD | 10 | 256QAM | 0.62 | 50 |  | ≥ 11 |  |
| FDD | Table A.3.3.2.2-2 | R.72-1 FDD | 5 | 256QAM | 0.62 | 25 |  | ≥ 11 |  |
| FDD | Table A.3.3.2.2-2 | R.72-2 FDD | 15 | 256QAM | 0.62 | 75 |  | ≥ 11 |  |
| FDD | Table A.3.3.2.2-2 | R.72-3 FDD | 20 | 256QAM | 0.62 | 100 |  | ≥ 11 |  |
| FDD | Table A.3.3.2.2-2 | R.73 FDD | 10 | 64QAM | 0.43 | 50 |  | ≥ 5 |  |
| FDD | Table A.3.3.2.2-2 | R.74 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 5 |  |
| FDD | Table A.3.3.2.2-3 | R.74-1 FDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 5 |  |
| FDD | Table A.3.3.2.2-3 | R.74-2 FDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 5 |  |
| FDD | Table A.3.3.2.2-3 | R.74-3 FDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 5 |  |
| FDD | Table A.3.3.2.2-2 | R.85 FDD | 10 | 64QAM | 1/2 | 24 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-2 | R.93 FDD | 10 | 64QAM | 0.52 | 24 |  | ≥ 1 |  |
| FDD | Table A.3.3.2.2-4 | R.95 FDD | 10 | 16QAM | 1/2 | 3 |  | M2 |  |
| FDD | Table A.3.3.2.2-3 | R.xx1 FDD | 10 | 1024QAM |  | 50 |  | 20, ≥ 22 | UE DL Category |

Table A.3.1.1-1G: Overview of DL reference measurement channels (FDD, PDSCH Performance (UE specific RS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| Without CSI-RS | | | | | | | | | |
| FDD | Table A.3.3.3.0-1 | R.70 FDD | 10 | QPSK | 0.65 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.0-1 | R.71 FDD | 10 | 16QAM | 0.6 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.0-2 | R.80 FDD | 10 | QPSK | 1/3 | 6 |  | M1, ≥ 0 |  |
| Two antenna ports (CSI-RS) | | | | | | | | | |
| FDD | Table A.3.3.3.1-1 | R.51 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-1 | R.51-1 FDD | 10 | 16QAM | 0.54 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-1 | R.51-2 FDD | 5 | 16QAM | 0.54 | 25 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-1 | R.51-3 FDD | 15 | 16QAM | 0.54 | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-1 | R.51-4 FDD | 20 | 16QAM | 0.54 | 100 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-1 | R.76 FDD | 10 | QPSK |  | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-1 FDD | 5 | QPSK |  | 25 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-2 FDD | 15 | QPSK |  | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-3 FDD | 20 | QPSK |  | 100 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-4 FDD | 5 | QPSK |  | 25 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-5 FDD | 10 | QPSK |  | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-6 FDD | 15 | QPSK |  | 75 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-3 | R.76-7 FDD | 20 | QPSK |  | 100 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-1 | R.86 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.1-1 | R.86A FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.1-1 | R.94 FDD | 10 | QPSK | 2/3 | 24 |  | ≥ 1 |  |
| Two antenna ports (CSI-RS, non Quasi Co-located) | | | | | | | | | |
| FDD | Table A.3.3.3.1-2 | R.52 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-2 | R.52-1 FDD | 10 | 16QAM | 0.54 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-2 | R.53 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-2 | R.54 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.1-2 | R.97 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| Four antenna ports (CSI-RS) | | | | | | | | | |
| FDD | Table A.3.3.3.2-1 | R.43 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.2-1 | R.50 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-2 | R.50A-1 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-2 | R.44 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.2-2 | R.45 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-2 | R.45-1 FDD | 10 | 16QAM | 1/2 | 39 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.2-1 | R.45A-1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-2 | R.45A-2 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-1 | R.48 FDD | 10 | QPSK |  | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.2-2 | R.60 FDD | 10 | QPSK | 1/2 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.2-3 | R.64 FDD | 10 | QPSK | 1/3 | 6 |  | 0 |  |
| FDD | Table A.3.3.3.2-1 | R.66 FDD | 10 | 256QAM | 0.77 | 50 |  | 11-15 |  |
| FDD | Table A.3.3.3.2-4 | R.69 FDD | 10 | QPSK | 0.74-0.8 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.3.3.2-1 | R.75 FDD | 10 | 16QAM | 0.57 | 50 |  | ≥ 5 |  |
| FDD | Table A.3.3.3.2-1 | R.75A FDD | 10 | 16QAM | 0.51 | 50 |  | ≥5 |  |
| FDD | Table A.3.3.3.2-1 | R.cc FDD | 10 | 16QAM | 0.64 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-1 | R.xx2 FDD | 10 | 1024QAM |  | 50 |  | 20, ≥ 22 | UE DL Category |
| Four antenna ports (CSI-RS, non Quasi Co-located) | | | | | | | | | |
| FDD | Table A.3.3.3.2-5 | R.98 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-5 | R.99 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2-6 | R.100 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| Eight antenna ports (CSI-RS) | | | | | | | | | |
| FDD | Table A.3.3.3.2A-1 | R.50A-2 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2A-1 | R.50A-3 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.2A-2 | R.108 FDD | 10 | QPSK | 1/2 | 4 |  | ≥ 1 |  |
| **Twelve antenna ports (CSI-RS)** | | | | | | | | | |
| FDD | Table A.3.3.3.3-1 | R.77 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| **Sixteen antenna ports (CSI-RS)** | | | | | | | | | |
| FDD | Table A.3.3.3.4-1 | R.78 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| **Twenty-four antenna ports (CSI-RS)** | | | | | | | | | |
| FDD | Table A.3.3.3.5-1 | R.88 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.3.3.5-1 | R.88A FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| **Thirty-two antenna ports (CSI-RS)** | | | | | | | | | |
| FDD | Table A.3.3.3.6-1 | R.89 FDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |

Table A.3.1.1-1H: Overview of DL reference measurement channels (TDD, PDSCH Performance, Single-antenna transmission (CRS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| TDD | Table A.3.4.1-1 | R.4 TDD | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-1 | R.42 TDD | 20 | QPSK | 1/3 | 100 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-1 | R.2 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-1 | R.2A TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-1 | R.42-1 TDD | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-1 | R.42-2 TDD | 5 | QPSK | 1/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-1 | R.42-3 TDD | 15 | QPSK | 1/3 | 75 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-2 | R.3-1 TDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-2 | R.3 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.1-3 | R.5 TDD | 3 | 64QAM | 3/4 | 15 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-3 | R.6 TDD | 5 | 64QAM | 3/4 | 25 |  | ≥ 2 |  |
| TDD | Table A.3.4.1-3 | R.7 TDD | 10 | 64QAM | 3/4 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.1-3 | R.8 TDD | 15 | 64QAM | 3/4 | 75 |  | ≥ 2 |  |
| TDD | Table A.3.4.1-3 | R.9 TDD | 20 | 64QAM | 3/4 | 100 |  | ≥ 3 |  |
| TDD | Table A.3.4.1-3a | R.6-1 TDD | 5 | 64QAM | 3/4 | 18 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-3a | R.7-1 TDD | 10 | 64QAM | 3/4 | 17 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-3a | R.8-1 TDD | 15 | 64QAM | 3/4 | 17 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-3a | R.9-1 TDD | 20 | 64QAM | 3/4 | 17 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-3a | R.9-2 TDD | 20 | 64QAM | 3/4 | 83 |  | ≥ 2 |  |
| TDD | Table A.3.4.1-6 | R.41 TDD | 10 | QPSK | 1/10 | 50 |  | ≥ 1 |  |
| Single PRB (Channel edge) | | | | | | | | | |
| TDD | Table A.3.4.1-4 | R.0 TDD | 3 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| TDD | Table A.3.4.1-4 | R.1 TDD | 10 / 20 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| Single PRB (MBSFN Configuration) | | | | | | | | | |
| TDD | Table A.3.4.1-5 | R.29 TDD | 10 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |

Table A.3.1.1-1I: Overview of DL reference measurement channels (TDD, PDSCH Performance, Multi-antenna transmission (CRS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| Two antenna ports | | | | | | | | | |
| TDD | Table A.3.4.2.1-1 | R.10 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-1 | R.11 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-1 | R.11-1 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-1 | R.11-2 TDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-1 | R.11-3 TDD | 10 | 16QAM | 1/2 | 40 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-1 | R.11-4 TDD | 10 | QPSK | 1/2 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-11 | R.11-13 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-1 | R.30 TDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-1 | R.30-1 TDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-1 | R.30-2 TDD | 20 | 16QAM | 1/2 | 100 |  | 3 |  |
| TDD | Table A.3.4.2.1-1 | R.35 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-1 | R.35-1 TDD | 20 | 64QAM | 0.39 | 100 |  | 4 |  |
| TDD | Table A.3.4.2.1-2 | R.35-2 TDD | 10 | 64QAM | 0.47 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-2 | R.46 TDD | 10 | QPSK |  | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.47 TDD | 10 | 16QAM |  | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-9 | R.47-1 TDD | 5 | 16QAM |  | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-9 | R.47-2 TDD | 15 | 16QAM |  | 75 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-9 | R.47-3 TDD | 20 | 16QAM |  | 100 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.11-5 TDD | 1.4 | 16QAM | 1/2 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.11-6 TDD | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.11-7 TDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.11-8 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-2 | R.11-9 TDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-2 | R.11-10 TDD | 10 | QPSK | 3/5 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-2 | R.11-11 TDD | 10 | QPSK | 0.48-0.58 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.11-12 TDD | 10 | QPSK | 0.54-0.66 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-2 | R.10-3 TDD | 10 | 16QAM | 0.57-0.58 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-3 | R.62 TDD | 10 | 16QAM | 1/2 | 3 |  | 0 |  |
| TDD | Table A.3.4.2.1-3 | R.63 TDD | 10 | 64QAM | 1/2 | 1 |  | 0 |  |
| TDD | Table A.3.4.2.1-4 | R.65 TDD | 20 | 256QAM | 0.6 | 100 |  | 11-15 |  |
| TDD | Table A.3.4.2.1-5 | R.67 TDD | 10 | 16QAM | 0.4 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-6 | R.79 TDD | 10 | 16QAM | 1/2 | 3 |  | M1, M2, ≥ 0 |  |
| TDD | Table A.3.4.2.1-7 | R.81 TDD | 10 | QPSK | 1/10 | 6 |  | M1, ≥ 0 |  |
| TDD | Table A.3.4.2.1-4 | R.84 TDD | 10 | 16QAM | 1/2 | 39 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-8 | R.aa TDD | 10 | QPSK | 0.54-0.64 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.1-8 | R.bb TDD | 10 | 16QAM | 0.27-0.32 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.1-8 | R.87 TDD | 10 | 64QAM | 0.39 | 50 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-8 | R.87-1 TDD | 10 | 16QAM | 0.44 | 50 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-8 | R.87-2 TDD | 5 | 64QAM | 0.39 | 25 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-8 | R.87-3 TDD | 15 | 64QAM | 0.39 | 75 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-8 | R.87-4 TDD | 20 | 64QAM | 0.39 | 100 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-10 | R.90 TDD | 10 | QPSK | 1/3 | 18 |  | M2 |  |
| TDD | Table A.3.4.2.1-10 | R.91 TDD | 10 | QPSK | 1/10 | 18 |  | M2 |  |
| TDD | Table A.3.4.2.1-10 | R.92-1 TDD | 10 | QPSK | 1/2 | 36 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-10 | R.92-2 TDD | 10 | QPSK | 1/2 | 36 |  | ≥1 |  |
| TDD | Table A.3.4.2.1-6 | R.103 TDD | 10 | QPSK | 1/3 | 3 |  | M1, M2 |  |
| TDD | Table A.3.4.2.1-6 | R.104 TDD | 10 | 64QAM | 0.4 | 3 |  | M1, M2 |  |
| Four antenna ports | | | | | | | | | |
| TDD | Table A.3.4.2.2-1 | R.12 TDD | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.13 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.14 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.2-1 | R.14-1 TDD | 10 | 16QAM | 1/2 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.14-2 TDD | 10 | 16QAM | 1/2 | 3 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.43 TDD | 20 | 16QAM | 1/2 | 100 |  | ≥2 |  |
| TDD | Table A.3.4.2.2-1 | R.36 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.2-1 | R.43-1 TDD | 1.4 | 16QAM | 1/2 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.43-2 TDD | 3 | 16QAM | 1/2 | 15 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.43-3 TDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-1 | R.43-4 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.2-1 | R.43-5 TDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 2 |  |
| TDD | Table A.3.4.2.2-2 | R.72 TDD | 10 | 256QAM | 0.62 | 50 |  | ≥ 11 |  |
| TDD | Table A.3.4.2.2-2 | R.72-1 TDD | 5 | 256QAM | 0.62 | 25 |  | ≥ 11 |  |
| TDD | Table A.3.4.2.2-2 | R.72-2 TDD | 15 | 256QAM | 0.62 | 75 |  | ≥ 11 |  |
| TDD | Table A.3.4.2.2-2 | R.72-3 TDD | 20 | 256QAM | 0.62 | 100 |  | ≥ 11 |  |
| TDD | Table A.3.4.2.2-2 | R.73 TDD | 10 | 64QAM | 0.44 | 50 |  | ≥ 5 |  |
| TDD | Table A.3.4.2.2-2 | R.74 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 5 |  |
| TDD | Table A.3.4.2.2-3 | R.74-1 TDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 5 |  |
| TDD | Table A.3.4.2.2-3 | R.74-2 TDD | 15 | 16QAM | 1/2 | 75 |  | ≥ 5 |  |
| TDD | Table A.3.4.2.2-3 | R.74-3 TDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 5 |  |
| TDD | Table A.3.4.2.2-2 | R.85 TDD | 10 | 64QAM | 1/2 | 24 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-2 | R.93 TDD | 10 | 64QAM | 0.50 | 24 |  | ≥ 1 |  |
| TDD | Table A.3.4.2.2-4 | R.95 TDD | 10 | 16QAM | 1/2 | 3 |  | M2 |  |

Table A.3.1.1-1J: Overview of DL reference measurement channels (TDD, PDSCH Performance (DRS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| Single antenna port | | | | | | | | | |
| TDD | Table A.3.4.3.1-1 | R.25 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.1-1 | R.26 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.1-1 | R.26-1 TDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.1-1 | R.27 TDD | 10 | 64QAM | 3/4 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.1-1 | R.27-1 TDD | 10 | 64QAM | 3/4 | 18 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.1-1 | R.28 TDD | 10 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.1-2 | R.80 TDD | 10 | QPSK | 1/10 | 6 |  | M1, ≥ 0 |  |
| Two antenna ports | | | | | | | | | |
| TDD | Table A.3.4.3.2-1 | R.31 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.2-1 | R.32 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.2-1 | R.32-1 TDD | 5 | 16QAM | 1/2 | [25] |  | ≥ 1 |  |
| TDD | Table A.3.4.3.2-1 | R.33 TDD | 10 | 64QAM | 3/4 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.2-1 | R.33-1 TDD | 10 | 64QAM | 3/4 | [18] |  | ≥ 1 |  |
| TDD | Table A.3.4.3.2-1 | R.34 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.2 | R.70 TDD | 10 | QPSK | 0.54-0.65 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.2 | R.71 TDD | 10 | 16QAM | 0.5-0.6 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.2-1 | R.86 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |

Table A.3.1.1-1K: Overview of DL reference measurement channels (TDD, PDSCH Performance (UE specific RS))

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| Two antenna ports (CSI-RS) | | | | | | | | | |
| TDD | Table A.3.4.3.3-1 | R.51 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-1 | R.51-1 TDD | 10 | 16QAM | 0.57 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-1 | R.51-2 TDD | 5 | 16QAM | 0.57 | 25 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-1 | R.51-3 TDD | 15 | 16QAM | 0.57 | 75 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-1 | R.51-4 TDD | 20 | 16QAM | 0.57 | 100 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-1 | R.76 FDD | 10 | QPSK |  | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-1 FDD | 5 | QPSK |  | 25 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-2 FDD | 15 | QPSK |  | 75 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-3 FDD | 20 | QPSK |  | 100 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-4 FDD | 5 | QPSK |  | 25 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-5 FDD | 10 | QPSK |  | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-6 FDD | 15 | QPSK |  | 75 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-3 | R.76-7 FDD | 20 | QPSK |  | 100 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.1-2 | R.76A TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.1-2 | R.94 TDD | 10 | QPSK | 2/3 | 24 |  | ≥ 1 |  |
| Two antenna ports (CSI-RS, non Quasi Co-located) | | | | | | | | | |
| TDD | Table A.3.4.3.3-2 | R.52 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-2 | R.52-1 TDD | 10 | 16QAM | 0.57 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-2 | R.53 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-2 | R.54 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.3-2 | R.97 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| Four antenna ports (CSI-RS) | | | | | | | | | |
| TDD | Table A.3.4.3.4-1 | R.44 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.4-5 | R.44A-1 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.4-1 | R.48 TDD | 10 | QPSK |  | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.4-2 | R.60 TDD | 10 | QPSK | 1/2 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.4-2 | R.61 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.4-2 | R.61-1 TDD | 10 | 16QAM | 1/2 | 39 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.4-1 | R.61A TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.4-3 | R.64 TDD | 10 | QPSK | 1/3 | 6 |  | 0 |  |
| TDD | Table A.3.4.3.4-1 | R.66 TDD | 20 | 256QAM |  | 100 |  | 11-15 |  |
| TDD | Table A.3.4.3.4-4 | R.69 TDD | 10 | QPSK | 0.61-0.8 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.4-1 | R.75 TDD | 10 | 16QAM | 0.57 | 50 |  | ≥ 5 |  |
| TDD | Table A.3.4.3.4-1 | R.75A TDD | 10 | 16QAM | 0.51 | 50 |  | ≥ 5 |  |
| TDD | Table A.3.4.3.4-1 | R.cc TDD | 10 | 16QAM |  | 50 |  | ≥ 2 |  |
| Four antenna ports (CSI-RS, non Quasi Co-located)) | | | | | | | | | |
| TDD | Table A.3.4.3.4-6 | R.98 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.4-6 | R.99 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.4-7 | R.100 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| Eight antenna ports (CSI-RS) | | | | | | | | | |
| TDD | Table A.3.4.3.5-1 | R.50 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.5-2 | R.45 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.5-2 | R.45-1 TDD | 10 | 16QAM | 1/2 | 39 |  | ≥ 1 |  |
| TDD | Table A.3.4.3.5-2 | R.45A TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.5-2 | R.45-2 TDD | 10 | 64QAM |  | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.5-3 | R.44A-2 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.5-3 | R.44A-3 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.5-1 | R.50-3 TDD | 5 | 16QAM | 1/2 | 25 |  | 8 |  |
| TDD | Table A.3.4.3.5-1 | R.50-4 TDD | 10 | 16QAM | 1/2 | 50 |  | 8 |  |
| TDD | Table A.3.4.3.5-1 | R.50-5 TDD | 15 | 16QAM | 1/2 | 75 |  | 8 |  |
| TDD | Table A.3.4.3.5-1 | R.50-6 TDD | 20 | 16QAM | 1/2 | 100 |  | 8 |  |
| TDD | Table A.3.4.3.5-4 | R.108 TDD | 10 | QPSK | 1/2 | 4 |  | ≥ 1 |  |
| **Twelve antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.6-1 | R.77 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| **Sixteen antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.7-1 | R.78 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| **Twenty-four antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.8-1 | R.88 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD | Table A.3.4.3.8-1 | R.88A TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| **Thirty-two antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.9-1 | R.89 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |

Table A.3.1.1-1L: Overview of DL reference measurement channels (PDCCH / PCFICH Performance)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.5.1-1 | R.15 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.15-1 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.15-2 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.16 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.16-1 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.16-2 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.16-3 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.16-4 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.17 FDD | 5 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.17-3 FDD | 10 | PDCCH |  |  |  |  |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.5.2-1 | R.15 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.15-1 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.15-2 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.16 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.16-1 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.16-2 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.16-3 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.16-4 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.17 TDD | 5 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.17-3 TDD | 10 | PDCCH |  |  |  |  |  |
| FS3 | | | | | | | | | |
| FS3 | Table A.3.5.3-1 | R.3 FS3 | 20 | PDCCH |  |  |  |  |  |
| FS3 | Table A.3.5.3-2 | R.4 FS3 | 20 | PDCCH |  |  |  |  |  |

Table A.3.1.1-1M: Overview of DL reference measurement channels (PHICH Performance)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD / TDD | Table A.3.6-1 | R.18 | 10 | PHICH |  |  |  |  |  |
| FDD / TDD | Table A.3.6-1 | R.19 | 10 | PHICH |  |  |  |  |  |
| FDD | Table A.3.6.1 | R.19-1 | 5 | PHICH |  |  |  |  |  |
| FDD / TDD | Table A.3.6-1 | R.20 | 5 | PHICH |  |  |  |  |  |
| FDD / TDD | Table A.3.6-1 | R.24 | 10 | PHICH |  |  |  |  |  |

Table A.3.1.1-1N: Overview of DL reference measurement channels (PBCH Performance)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD / TDD | Table A.3.7-1 | R.21 | 1.4 | QPSK | 40/ 1920 |  |  |  |  |
| FDD / TDD | Table A.3.7-1 | R.22 | 1.4 | QPSK | 40/ 1920 |  |  |  |  |
| FDD / TDD | Table A.3.7-1 | R.23 | 1.4 | QPSK | 40/ 1920 |  |  |  |  |
| FDD / TDD | Table A.3.7-1 | R.23-1 | 1.4 | QPSK | 40/ 4416 |  |  |  |  |

Table A.3.1.1-1O: Overview of DL reference measurement channels (PMCH Performance)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.8.1-1 | R.40 FDD | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| FDD | Table A.3.8.1-1 | R.37 FDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.8.1-2 | R.38 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 1 |  |
| FDD | Table A.3.8.1-3 | R.39-1 FDD | 5 | 64QAM | 2/3 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.8.1-3 | R.39 FDD | 10 | 64QAM | 2/3 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-4 | R.81-1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-4 | R.81-2 FDD | 10 | 64QAM | 2/3 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-5 | R.82-1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-6 | R.83-1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-6 | R.83-2 FDD | 10 | 64QAM | 2/3 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-7 | R.84-1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-8 | R.85-1 FDD | 3 | QPSK | 1/3 | 15 |  | ≥ 1 |  |
| FDD | Table A.3.8.1-8 | R.85-2 FDD | 5 | 16QAM | 1/2 | 25 |  | ≥ 1 |  |
| FDD | Table A.3.8.1-8 | R.85-3 FDD | 10 | 64QAM | 2/3 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-9 | R.106-1 FDD | 10 | 64QAM | 0.48 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-9 | R.106-2 FDD | 10 | 64QAM | 0.52 | 50 |  | ≥ 2 |  |
| FDD | Table A.3.8.1-10 | R.107 FDD | 10 | 16QAM | 0.46 | 50 |  | ≥ 2 |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.8.2-1 | R.40 TDD | 1.4 | QPSK | 1/3 | 6 |  | ≥ 1 |  |
| TDD | Table A.3.8.2-1 | R.37 TDD | 10 | QPSK | 1/3 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.8.2-2 | R.38 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 1 |  |
| TDD | Table A.3.8.2-3 | R.39-1 TDD | 5 | 64QAM | 2/3 | 25 |  | ≥ 1 |  |
| TDD | Table A.3.8.2-3 | R.39 TDD | 10 | 64QAM | 2/3 | 50 |  | ≥ 2 |  |

Table A.3.1.1-1P: Overview of DL reference measurement channels (Sustained data rate)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.9.1-1 | R.31-1 FDD | 10 | 64QAM | 0.40 |  |  | ≥ 1 |  |
| FDD | Table A.3.9.1-2 | R.31-1A FDD | 20 | 64QAM | 0.41 |  |  | ≥ 1 |  |
| FDD | Table A.3.9.1-1 | R.31-2 FDD | 10 | 64QAM | 0.59-0.64 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.1-1 | R.31-3 FDD | 20 | 64QAM | 0.59-0.62 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.1-1 | R.31-3A FDD | 10 | 64QAM | 0.85-0.90 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.1-1 | R.31-3C FDD | 15 | 64QAM | 0.87-0.91 |  |  | ≥ 3 |  |
| FDD | Table A.3.9.1-1 | R.31-4 FDD | 20 | 64QAM | 0.87-0.90 |  |  | ≥ 3 |  |
| FDD | Table A.3.9.1-1 | R.31-4B FDD | 15 | 64QAM | 0.85-0.88 |  |  | ≥ 4 |  |
| FDD | Table A.3.9.1-1 | R.31-5 FDD | 15 | 64QAM | 0.85-0.91 |  |  | ≥ 3 |  |
| FDD | Table A.3.9.1-2 | R.31-6 FDD | 5 | 64QAM | 0.83-0.85 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.1-2 | R.31-7 FDD | 10 | 64QAM | 0.78-0.83 |  |  | ≥ 6 |  |
| FDD | Table A.3.9.1-2 | R.31-8 FDD | 15 | 64QAM | 0.77-0.80 |  |  | ≥ 6 |  |
| FDD | Table A.3.9.1-2 | R.31-9 FDD | 20 | 64QAM | 0.79-0.81 |  |  | ≥ 6 |  |
| FDD | Table A.3.9.1-2 | R.31-10 FDD | 5 | 64QAM | 0.78-0.85 |  |  | ≥ 6 |  |
| FDD | Table A.3.9.1-3 | R.68 FDD | 20 | 256QAM | 0.74-0.85 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-1 FDD | 15 | 256QAM | 0.74-0.88 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-2 FDD | 10 | 256QAM | 0.74-0.85 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-3 FDD | 5 | 256QAM | 0.77-0.85 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-4 FDD | 10 | 256QAM | 0.78-0.83 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-5 FDD | 15 | 256QAM | 0.79-0.82 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-6 FDD | 20 | 256QAM | 0.78-0.80 |  |  | 11-12 |  |
| FDD | Table A.3.9.1-3 | R.68-7 FDD | 5 | 256QAM | 0.77-0.85 |  |  | 11-12 |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.9.2-1 | R.31-1 TDD | 10 | 64QAM | 0.40 |  |  | ≥ 1 |  |
| TDD | Table A.3.9.2-1 | R.31-1A TDD | 20 | 64QAM | 0.41 |  |  | ≥ 1 |  |
| TDD | Table A.3.9.2-1 | R.31-2 TDD | 10 | 64QAM | 0.59-0.64 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.2-1 | R.31-3 TDD | 20 | 64QAM | 0.59-0.62 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.2-1 | R.31-3A TDD | 15 | 64QAM | 0.87-0.90 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.2-1 | R.31-4 TDD | 20 | 64QAM | 0.87-0.90 |  |  | ≥ 3 |  |
| TDD | Table A.3.9.2-1 | R.31-4A TDD | 20 | 64QAM | 0.87-0.90 |  |  | ≥ 3 |  |
| TDD | Table A.3.9.2-1 | R.31-5 TDD | 15 | 64QAM | 0.85-0.88 |  |  | ≥ 3 |  |
| TDD | Table A.3.9.2-1 | R.31-5A TDD | 15 | 64QAM | 0.85-0.88 |  |  | ≥ 3 |  |
| TDD | Table A.3.9.2-1 | R.31-6 TDD | 10 | 64QAM | 0.85-0.88 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.2-1A | R.31-7 TDD | 10 | 64QAM | 0.78-0.82 |  |  | ≥ 6 |  |
| TDD | Table A.3.9.2-1A | R.31-8 TDD | 15 | 64QAM | 0.77-0.79 |  |  | ≥ 6 |  |
| TDD | Table A.3.9.2-1A | R.31-9 TDD | 20 | 64QAM | 0.79-0.81 |  |  | ≥ 6 |  |
| TDD | Table A.3.9.2-1A | R.31-7 TDD | 10 | 64QAM | 0.75-0.85 |  |  | 8 |  |
| TDD | Table A.3.9.2-1A | R.31-8 TDD | 15 | 64QAM | 0.76-0.84 |  |  | 8 |  |
| TDD | Table A.3.9.2-1A | R.31-9 TDD | 20 | 64QAM | 0.74-0.85 |  |  | 8 |  |
| TDD | Table A.3.9.2-2 | R.68 TDD | 20 | 256QAM |  |  |  | 11-12 |  |
| TDD | Table A.3.9.2-2 | R.68-1 TDD | 15 | 256QAM |  |  |  | 11-12 |  |
| TDD | Table A.3.9.2-2 | R.68-2 TDD | 10 | 256QAM |  |  |  | 11-12 |  |
| TDD | Table A.3.9.2-2 | R.68-3 TDD | 20 | 256QAM |  |  |  | 11-12 |  |
| TDD | Table A.3.9.2-2 | R.68-4 TDD | 15 | 256QAM |  |  |  | 11-12 |  |
| TDD | Table A.3.9.2-3 | R.68-5 TDD | 10 | 256QAM | 0.78-0.82 |  |  | 11-12 |  |
| TDD | Table A.3.9.2-3 | R.68-6 TDD | 15 | 256QAM | 0.79-0.82 |  |  | 11-12 |  |
| TDD | Table A.3.9.2-3 | R.68-7 TDD | 20 | 256QAM | 0.78-0.80 |  |  | 11-12 |  |
| TDD | Table A.3.9.2-3 | R.68-8 TDD | 10 | 256QAM | 0.70-0.77 |  |  | 8 |  |
| TDD | Table A.3.9.2-3 | R.68-9 TDD | 15 | 256QAM | 0.70-0.76 |  |  | 8 |  |
| TDD | Table A.3.9.2-3 | R.68-10 TDD | 20 | 256QAM | 0.69-0.77 |  |  | 8 |  |
| FDD, EPDCCH scheduling | | | | | | | | | |
| FDD | Table A.3.9.3-1 | R.31E-1 FDD | 10 | 64QAM | 0.40-0 |  |  | ≥ 1 |  |
| FDD | Table A.3.9.3-1 | R.31E-2 FDD | 10 | 64QAM | 0.59-0.66 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.3-1 | R.31E-3 FDD | 20 | 64QAM | 0.59-0.63 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.1-1 | R.31E-3C FDD | 15 | 64QAM | 0.87-0.92 |  |  | ≥ 3 |  |
| FDD | Table A.3.9.3-1 | R.31E-3A FDD | 10 | 64QAM | 0.85-0.92 |  |  | ≥ 2 |  |
| FDD | Table A.3.9.3-1 | R.31E-4 FDD | 20 | 64QAM | 0.87-0.91 |  |  | ≥ 3 |  |
| FDD | Table A.3.9.1-1 | R.31E-4B FDD | 15 | 64QAM | 0.87-0.90 |  |  | ≥ 4 |  |
| TDD, EPDCCH scheduling | | | | | | | | | |
| TDD | Table A.3.9.4-1 | R.31E-1 TDD | 10 | 64QAM | 0.40-0.41 |  |  | ≥ 1 |  |
| TDD | Table A.3.9.4-1 | R.31E-2 TDD | 10 | 64QAM | 0.59-0.65 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.4-1 | R.31E-3 TDD | 20 | 64QAM | 0.59-0.63 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.4-1 | R.31E-3A TDD | 15 | 64QAM | 0.87-0.92 |  |  | ≥ 2 |  |
| TDD | Table A.3.9.4-1 | R.31E-4 TDD | 20 | 64QAM | 0.87-0.90 |  |  | ≥ 3 |  |

Table A.3.1.1-1Q: Overview of DL reference measurement channels (EPDCCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.10.1-1 | R.55 FDD | 10 | EPDCCH |  |  |  |  |  |
| FDD | Table A.3.10.1-1 | R.55-1 FDD | 10 | EPDCCH |  |  |  |  |  |
| FDD | Table A.3.10.1-1 | R.56 FDD | 10 | EPDCCH |  |  |  |  |  |
| FDD | Table A.3.10.1-1 | R.57 FDD | 10 | EPDCCH |  |  |  |  |  |
| FDD | Table A.3.10.1-1 | R.58 FDD | 10 | EPDCCH |  |  |  |  |  |
| FDD | Table A.3.10.1-1 | R.59 FDD | 10 | EPDCCH |  |  |  |  |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.10.2-1 | R.55 TDD | 10 | EPDCCH |  |  |  |  |  |
| TDD | Table A.3.10.2-1 | R.55-1 TDD | 10 | EPDCCH |  |  |  |  |  |
| TDD | Table A.3.10.2-1 | R.56 TDD | 10 | EPDCCH |  |  |  |  |  |
| TDD | Table A.3.10.2-1 | R.57 TDD | 10 | EPDCCH |  |  |  |  |  |
| TDD | Table A.3.10.2-1 | R.58 TDD | 10 | EPDCCH |  |  |  |  |  |
| TDD | Table A.3.10.2-1 | R.59 TDD | 10 | EPDCCH |  |  |  |  |  |

Table A.3.1.1-1R: Overview of DL reference measurement channels (MPDCCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.11.1-1 | R.82 FDD | 10 | MPDCCH |  |  |  |  |  |
| FDD | Table A.3.11.1-1 | R.83 FDD | 10 | MPDCCH |  |  |  |  |  |
| FDD | Table A.3.11.1-1 | R.96 FDD | 10 | MPDCCH |  |  |  |  |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.11.2-1 | R.82 TDD | 10 | MPDCCH |  |  |  |  |  |
| TDD | Table A.3.11.2-1 | R.83 TDD | 10 | MPDCCH |  |  |  |  |  |
| TDD | Table A.3.11.2-1 | R.96 TDD | 10 | MPDCCH |  |  |  |  |  |

Table A.3.1.1-1S: Overview of DL reference measurement channels (NPDSCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW(KHz) | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| HD-FDD | Table A.3.12.1.2-1 | R.NB.5 FDD | 200 | QPSK | 1/3 |  |  | NB1 |  |
| HD-FDD | Table A.3.12.1.2-1 | R.NB.5-1 FDD | 200 | QPSK | 1/3 |  |  | NB1 |  |
| HD-FDD | Table A.3.12.2.1-1 | R.NB.6 FDD | 200 | QPSK | 1/2 |  |  | NB1 |  |
| HD-FDD | Table A.3.12.2.1-1 | R.NB.6-1 FDD | 200 | QPSK | 1/3 |  |  | NB1 |  |

Table A.3.1.1-1T: Overview of DL reference measurement channels (NPDCCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW(KHz) | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| HD-FDD | Table A.3.13.1-1 | R.NB.3 FDD | 200 | QPSK |  |  |  | NB1 |  |
| HD-FDD | Table A.3.13.1-1 | R.NB.4 FDD | 200 | QPSK |  |  |  | NB1 |  |

Table A.3.1.1-1U: Overview of DL reference measurement channels (NPBCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW(KHz) | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| HD-FDD | Table A.3.14-1 | R.NB.1 FDD | 200 | QPSK |  |  |  | NB1 |  |
| HD-FDD | Table A.3.14-1 | R.NB.2 FDD | 200 | QPSK |  |  |  | NB1 |  |

Table A.3.1.1-1V: Overview of DL reference measurement channels (FS3)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FS3 | | | | | | | | | |
| FS3 | Table A.3.5.1.1-2 | R.1 FS3 | 20 | 64QAM | 0.6 | 100 |  | ≥ 5 |  |
| FS3 | Table A.3.15.2.1-1 | R.2 FS3 | 20 | 16QAM | 1/2 | 100 |  | ≥ 5 |  |
| FS3 | Table A.3.9.5-1 | R.5 FS3 | 20 | 64QAM | 0.88-0.89 | 100 |  | ≥ 5 | not supporting both initial and end partial SF |
| FS3 | Table A.3.9.5-1 | R.6 FS3 | 20 | 64QAM | 0.77-0.89 | 100 |  | ≥ 5 | supporting end partial SF |
| FS3 | Table A.3.9.5-1 | R.7 FS3 | 20 | 64QAM | 0.88-0.90 | 100 |  | ≥ 5 | supporting initial partial SF but not supporting end partial SF |
| FS3 | Table A.3.9.5-1 | R.8 FS3 | 20 | 64QAM | 0.79-0.80 | 100 |  | ≥ 5 | not supporting both initial and end partial SF |
| FS3 | Table A.3.9.5-1 | R.9 FS3 | 20 | 64QAM | 0.79-0.82 | 100 |  | ≥ 5 | supporting end partial SF |
| FS3 | Table A.3.9.5-1 | R.10 FS3 | 20 | 64QAM | 0.79-0.81 | 100 |  | ≥ 5 | supporting initial partial SF but not supporting end partial SF |
| FS3 | Table A.3.9.5-2 | R.11 FS3 | 20 | 256QAM | 0.75-0.85 | 100 |  | ≥ 11 | not supporting both initial and end partial SF |
| FS3 | Table A.3.9.5-2 | R.12 FS3 | 20 | 256QAM | 0.74-0.85 | 100 |  | ≥ 11 | supporting end partial SF |
| FS3 | Table A.3.9.5-2 | R.13 FS3 | 20 | 256QAM | 0.74-0.85 | 100 |  | ≥ 11 | supporting initial partial SF but not supporting end partial SF |
| FS3 | Table A.3.9.5-2 | R.14 FS3 | 20 | 256QAM | 0.78-0.79 | 100 |  | ≥ 11 | not supporting both initial and end partial SF |
| FS3 | Table A.3.9.5-2 | R.15 FS3 | 20 | 256QAM | 0.74-0.79 | 100 |  | ≥ 11 | supporting end partial SF |
| FS3 | Table A.3.9.5-2 | R.16 FS3 | 20 | 256QAM | 0.77-0.79 | 100 |  | ≥ 11 | supporting initial partial SF but not supporting end partial SF |

Table A.3.1.1-1W: Overview of DL reference measurement channels (Slot-PDSCH/Subslot-PDSCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.16.1-1 | R.sTTI.1 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥2 | Slot-PDSCH |
| FDD | Table A.3.16.1-2 | R.sTTI.2 FDD | 10 | 16QAM | 0.45 | 50 |  | ≥2 | Subslot-PDSCH |
| FDD | Table A.3.16.1-3 | R.sTTI.3 FDD | 10 | QPSK | 1/3 | 50 |  | ≥2 | Slot-PDSCH |
| FDD | Table A.3.16.1-4 | R.sTTI.4 FDD | 10 | QPSK | 1/3 | 50 |  | ≥2 | Subslot-PDSCH |
| TDD | | | | | | | | | |
| TDD | Table A.3.16.2-1 | R.sTTI.1 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥2 | Slot-PDSCH |
| TDD | Table A.3.16.2-1 | R.sTTI.2 TDD | 10 | QPSK | 1/3 | 50 |  | ≥2 | Slot-PDSCH |

Table A.3.1.1-1X: Overview of DL reference measurement channels (SPDCCH)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD | | | | | | | | | |
| FDD | Table A.3.17.1-1 | R.sTTI.10 FDD | 10 | SPDCCH |  |  |  |  |  |
| FDD | Table A.3.17.1-1 | R.sTTI.11 FDD | 10 | SPDCCH |  |  |  |  |  |
| TDD | | | | | | | | | |
| TDD | Table A.3.17.2-1 | R.sTTI.10 TDD | 10 | SPDCCH |  |  |  |  |  |
| TDD | Table A.3.17.2-1 | R.sTTI.11 TDD | 10 | SPDCCH |  |  |  |  |  |

## A.3.2 Reference measurement channel for receiver characteristics

Unless otherwise stated, Tables A.3.2-1, A.3.2-1a, A.3.2-1b, A.3.2-2, A.3.2-2a and A.3.2-2b are applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4 (Maximum input level).

Unless otherwise stated, Tables A.3.2-3, A.3.2-3a, A.3.2-3b, A.3.2-4, A.3.2-4a and A.3.2-4b are applicable for subclause 7.4 (Maximum input level).

Unless otherwise stated, Tables A.3.2-1, A.3.2-1a, A.3.2-1b, A.3.2-2, A.3.2-2a and A.3.2-2b also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

For transmissions in TDD Band 46, Table A.3.2-2c is applicable for measurements of Receiver Characteristics (clause 7) except for the Maximum Input Level (clause 7.4A) for which Table A.3.2-4d and Table A.3.2-7 apply. For these measurements, the discovery signals measurement timing configuration (DMTC) periodicity shall be set at *dmtc-Periodicity* = 40 ms with an offset *dmtc-Offset* = 0 for the channel and the DRS shall be transmitted in the first subframe of each DMTC occasion. Furthermore, no PBCH is transmitted and the PDSCH is also scheduled in subframe #5.

Table A.3.2-1 Fixed Reference Channel for Receiver Requirements (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 1320 | 2216 | 4392 | 6712 | 8760 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 152 | 872 | 1800 | 4392 | 6712 | 8760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 1 | 1 | 1 | 2 | 2 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 1 | 1 | 1 | 1 | 2 | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 3780 | 6300 | 13800 | 20700 | 27600 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 528 | 2940 | 5460 | 12960 | 19860 | 26760 |
| Max. Throughput averaged over 1 frame | kbps | 341.6 | 1143.2 | 1952.8 | 3952.8 | 6040.8 | 7884 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: 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) | | | | | | | |

Table A.3.2-1a Fixed Reference Channel for Receiver Requirements (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 14 | 14 | 14 | 14 | 14 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | 152 | 840 | 840 | 904 | 904 | 904 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 3528 | 3528 | 3864 | 3864 | 3864 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | 528 | 2688 | 2688 | 3024 | 3024 | 3024 |
| Max. Throughput averaged over 1 frame | kbps | 341.6 | 884 | 884 | 890.4 | 890.4 | 890.4 |
| UE DL Category |  | 0 | 0 | 0 | 0 | 0 | 0 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.  Note 3: For Sub-Frame 0, it is assumed the 6PRBs are allocated in the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 4: For HD-FDD UE, the downlink subframes are scheduled at the 0th, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled. | | | | | | | |

Table A.3.2-1b Fixed Reference Channel for Receiver Requirements (FDD and HD-FDD) – for CAT-M1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 4 | 4 | 4 | 4 | 4 | 4 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame  (Note 6) |  | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,8 | Bits | 256 | 256 | 256 | 328 | 328 | 328 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 256 | 328 | 328 | 328 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,8 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,8 | Bits | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 51.2 | 51.2 | 204.8 | 262.4 | 262.4 | 262.4 |
| Max. Throughput averaged over 1 frames for HD-FDD | kbps | 25.6 | 25.6 | 76.8 | 98.4 | 98.4 | 98.4 |
| UE DL Category |  | M1 | M1 | M1 | M1 | M1 | M1 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.  Note 3: The scheduled narrowband other than 1.4MHz and 3MHz channel bandwidth avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz and 3MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding M-PDCCH is scheduled 2 subframesbefore the corresponding PDSCH transmission.  Note 5: 2 resource blocks allocated to M-PDCCH | | | | | | | |

Table A.3.2-1c Fixed Reference Channel for Receiver Requirements (HD-FDD) without repetition – for CAT-NB1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Channel bandwidth | MHz | 0.2 |
| Number of subcarriers |  | 12 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Number of HARQ Processes | Processes | 1 |
| Maximum number of HARQ transmissions |  | 1 |
| Transport block size | Bits | 88 |
| Number of Sub-Frames per transport block |  | 1 |
| Transport block CRC | Bits | 24 |
| Binary Channel Bits Per Sub-Frame | Bits | 320 |
| LTE CRS port |  | N/A |
| Number of NRS ports |  | 1 |
| Number of NPDSCH repetitions (Note 7) |  | 0 |
| UE DL Category |  | NB1 |
| Note 1: Category NB1 in stand-alone mode has been considered here.  Note 2: Reference signal, Synchronization signals and NPBCH allocated as per TS 36.211.  Note 3: 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 4: Parameters related to NPDSCH scheduling are defined in Table A.3.2-1e to Table A.3.2-1g.  Note 5: NPDCCH and information bit payload are not transmitted in the subframes used for transmission of SI messages.  Note 6: SI messages transmission should be prioritized over NPDCCH transmission in case of collision. NPDCCH transmission is postponed until the next NB-IoT downlink subframe in case NPDCCH transmission occurs in a non NB-IoT downlink subframe, where an NB-IoT downlink subframe is a subframe that does not contain NPSS/NSSS/NPBCH/SIB1-NB transmission.  Note 7: Number of repetition NRep as defined in table 16.4.1.3-2 in TS 36.213 [6]. | | |

Table A.3.2-1d: Void

Table A.3.2-1e: General configuration for CAT-NB1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| NB-IoT downlink subframe bitmap for anchor carrier *(downlinkBitmap)* |  | Not configued |
| NB-IoT downlink subframe bitmap for non-anchor carrier *(downlinkBitmapNonAnchor)* |  | Not configured |
| Downlink gap configuration for anchor carrier *(dl-Gap)* |  | Not configured |
| Downlink gap configuration for non-anchor carrier *(dl-GapNonAnchor)* |  | Not configured |

Table A.3.2-1f: NPDCCH configuration for NPDSCH scheduling

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| DCI format |  | DCI format N1 |
| NPDCCH format |  | 1 |
| Scheduling delay () |  | 0 |
| DCI subframe repetition number |  | 00 |
| (*npdcch-NumRepetitions*) |  | 1 |
| G  (*NPDCCH-startSF-USS*) |  | 8 |
| (*npdcch-Offset-USS*) |  | 1/4 |

Table A.3.2-1g: NPUSCH format 2 configurations for NPDSCH scheduling

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Scheduling delay () |  | 0 |
| (*ack-NACK-NumRepetitions*) |  | 1 |
| ACK/NACK resource field |  | 0 |

Table A.3.2-1h: Fixed Reference Channel for Receiver Requirements (FDD and HD-FDD) – for CAT-M2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 6) |  | 4 | 8 | 16 | 16 | 16 | 16 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame (Note 4) |  | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,8 | Bits | 256 | 680 | 1384 | 1384 | 1384 | 1384 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | N/A | N/A | 1384 | 1384 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,8 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3,8 | Bits | 912 | 2016 | 4032 | 4416 | 4416 | 4416 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | N/A | N/A | 4416 | 4416 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 51.2 | 136.0 | 276.8 | 276.8 | 1107.2 | 1107.2 |
| Max. Throughput averaged over 1 frames for HD-FDD | kbps | 25.6 | 68.0 | 138.4 | 138.4 | 415.2 | 415.2 |
| UE DL Category |  | M2 | M2 | M2 | M2 | M2 | M2 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.  Note 3: The scheduled wideband other than 1.4MHz/3MHz/5MHz/15MHz channel bandwidth avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz/3MHz/5MHz/10MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.  Note 5: 2 resource blocks allocated to MPDCCH.  Note 6: 4 resource blocks in each narrowband allocated to PDSCH. | | | | | | | |

Table A.3.2-2 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 4, 9 |  | 408 | 1320 | 2216 | 4392 | 6712 | 8760 |
| For Sub-Frame 1, 6 |  | N/A | 968 | 1544 | 3240 | 4968 | 6712 |
| 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 4, 9 |  | 1 | 1 | 1 | 1 | 2 | 2 |
| For Sub-Frame 1, 6 |  | N/A | 1 | 1 | 1 | 1 | 2 |
| 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 4, 9 |  | 1368 | 3780 | 6300 | 13800 | 20700 | 27600 |
| For Sub-Frame 1, 6 |  | N/A | 3276 | 5556 | 11256 | 16956 | 22656 |
| 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(0,4,5,9), 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 [4]  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 [4] | | | | | | | |

Table A.3.2-2a Fixed Reference Channel for Receiver Requirements (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 14 | 14 | 14 | 14 | 14 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 4, 9 |  | 408 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frame 1, 6 |  | N/A | 872 | 872 | 872 | 872 | 872 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 208 | 1000 | 1000 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  | 1368 | 3528 | 3528 | 3864 | 3864 | 3864 |
| For Sub-Frame 1, 6 |  | N/A | 3048 | 3048 | 3048 | 3048 | 3048 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 672 | 2832 | 2832 | 3168 | 3168 | 3168 |
| Max. Throughput averaged over 1 frame | kbps | 102.4 | 474.4 | 474.4 | 474.4 | 474.4 | 474.4 |
| UE DL Category |  | 0 | 0 | 0 | 0 | 0 | 0 |
| Note 1: For normal subframes(0,4,5,9), 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 [4]  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 [4] | | | | | | | |

Table A.3.2-2b Fixed Reference Channel for Receiver Requirements (TDD) – for CAT-M1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 4 | 4 | 4 | 4 | 4 | 4 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D) |  | 3 | 3 | 3 | 3 | 3 | 3 |
| 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 4, 9 |  | 256 | 256 | 256 | 328 | 328 | 328 |
| For Sub-Frame 1, 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 256 | 256 | 256 | 328 | 328 | 328 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frame 1, 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| Max. Throughput averaged over 1 frame | kbps | 76.8 | 76.8 | 76.8 | 98.4 | 98.4 | 98.4 |
| UE DL Category |  | M1 | M1 | M1 | M1 | M1 | M1 |
| Note 1: For normal subframes(0,4,5,9), 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: 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 [4]  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 [4]  Note 6: For Sub-Frame 0, the scheduled narrowband avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 7: 2 resource blocks allocated to MPDCCH | | | | | | | |

Table A.3.2-2c Fixed Reference Channel for Receiver Requirements (TDD Band 46)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 100 |
| Uplink-Downlink Configuration |  | N/A |
| Subcarriers per resource block |  | 12 |
| Allocated subframes per Radio Frame (D) |  | 8 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions |  | N/A |
| Information Bit Payload per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 8760 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 8760 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 2 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 27600 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 27312 |
| Max. Throughput averaged over 1 frame | kbps | 7008 |
| UE Category |  | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal and Synchronization signals allocated as per TS 36.211 [4].  Note 3: 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). | | |

Table A.3.2-2d: Fixed Reference Channel for Receiver Requirements (TDD) – for CAT-M2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 8) |  | 4 | 8 | 16 | 16 | 16 | 16 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D) |  | 3 | 3 | 3 | 3 | 3 | 3 |
| 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 4, 9 |  | 256 | 680 | 1384 | 1384 | 1384 | 1384 |
| For Sub-Frame 1, 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 256 | 680 | 1384 | 1384 | 1384 | 1384 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 1, 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  | 912 | 2016 | 4032 | 4416 | 4416 | 4416 |
| For Sub-Frame 1, 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 912 | 2016 | 4032 | 4416 | 4416 | 4416 |
| Max. Throughput averaged over 1 frame | kbps | 76.8 | 204.0 | 415.2 | 415.2 | 415.2 | 415.2 |
| UE DL Category |  | M2 | M2 | M2 | M2 | M2 | M2 |
| Note 1: For normal subframes(0,4,5,9), 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: 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 [4]  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 [4]  Note 6: For Sub-Frame 0, the scheduled narrowband avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 7: 2 resource blocks allocated to MPDCCH  Note 8: 4 resource blocks in each narrowband allocated to PDSCH. | | | | | | | |

Table A.3.2-2e Fixed Reference Channel for Receiver Requirements (TDD) – for CAT-NB1 and CAT-NB2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Channel bandwidth | MHz | 0.2 |
| Number of subcarriers |  | 12 |
| Uplink-Downlink Configuration (Note 7) |  | 1 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Number of HARQ Processes | Processes | 1 |
| Maximum number of HARQ transmissions |  | 1 |
| Transport block size | Bits | 88 |
| Number of Sub-Frames per transport block |  | 1 |
| Transport block CRC | Bits | 24 |
| Binary Channel Bits Per Sub-Frame | Bits | 320 |
| LTE CRS port |  | N/A |
| Number of NRS ports |  | 1 |
| Number of NPDSCH repetitions |  | 1 |
| UE DL Category |  | NB1 or NB2 |
| Note 1: Category NB1 or NB2 in stand-alone mode has been considered here.  Note 2: Reference signal, Synchronization signals and NPBCH allocated as per TS 36.211.  Note 3: 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 4: Parameters related to NPDSCH scheduling are defined in Table A.3.2-1e to Table A.3.2-1g.  Note 5: NPDCCH and information bit payload are not transmitted in the subframes used for transmission of SI messages.  Note 6: SI messages transmission should be prioritized over NPDCCH transmission in case of collision. NPDCCH transmission is postponed until the next NB-IoT downlink subframe in case NPDCCH transmission occurs in a non NB-IoT downlink subframe, where an NB-IoT downlink subframe is a subframe that does not contain NPSS/NSSS/NPBCH/SIB1-NB transmission.  Note 7: As per Table 4.2-2 in TS 36.211 [4]  Note 8: Number of repetition NRep as defined in table 16.4.1.3-2 in TS 36.213 [6]. | | |

Table A.3.2-3 Fixed Reference Channel for Maximum input level for UE Categories ≥ 3(FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Allocated subframes per Radio Frame |  | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 6456 | 12576 | 28336 | 45352 | 61664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 2 | 3 | 5 | 8 | 11 |
| 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 1,2,3,4,6,7,8,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 8820 | 16380 | 38880 | 59580 | 80280 |
| Max. Throughput averaged over 1 frame | kbps | 2387.2 | 7448.8 | 12547 | 27294 | 42046 | 55498 |
| Note 1: 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.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.2-3a Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 18 | 17 | 17 | 17 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame |  | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2984 | 8504 | 10296 | 10296 | 10296 | 10296 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 6456 | 8248 | 10296 | 10296 | 10296 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4104 | 11340 | 13608 | 14076 | 14076 | 14076 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 8820 | 11088 | 14076 | 14076 | 14076 |
| Max. Throughput averaged over 1 frame | kbps | 2387.2 | 7448.8 | 9079.6 | 9266.4 | 9266.4 | 9266.4 |
| Note 1: 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.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.2-3b Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 83 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame |  | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 51024 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 6456 | 12576 | 28336 | 45352 | 51024 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 2 | 3 | 5 | 8 | 9 |
| 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 | 9 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 68724 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 8820 | 16380 | 38880 | 59580 | 66204 |
| Max. Throughput averaged over 1 frame | kbps | 2387.2 | 7448.8 | 12547 | 27294 | 42046 | 45922 |
| Note 1: 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.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.2-3c Fixed Reference Channel for Maximum input level for UE DL Category 0 (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame |  | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | N/A | 1000 | 1000 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 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 |  | N/A | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 1512 | 1512 | 1656 | 1656 | 1656 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | N/A | 1512 | 1512 | 1656 | 1656 | 1656 |
| Max. Throughput averaged over 1 frame | kbps | 800 | 900 | 900 | 900 | 900 | 900 |
| Note 1: 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.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.  Note 3: For Sub-Frame 0, it is assumed that the allocated 2PRBs are scheduled on the RBs other than the center 6PRBs as most of the symbols are occupied by PBCH and synchronization signals. | | | | | | | |

Table A.3.2-3d Fixed Reference Channel for Maximum input level for UE DL Category M1 (FDD and HD-FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame (Note 6) |  | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 3, 8 | Bits | 552 | 552 | 552 | 552 | 552 | 552 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 552 | 552 | 552 | 552 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3, 8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 |  | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3, 8 | Bits | 912 | 1008 | 1008 | 1008 | 1008 | 1008 |
| For Sub-Frames 0,1,2,5,7,9 |  | N/A | N/A | 1008 | 1008 | 1008 | 1008 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 110.4 | 110.4 | 441.6 | 441.6 | 441.6 | 441.6 |
| Max. Throughput averaged over 1 frame for HD-FDD |  | 55.2 | 55.2 | 165.6 | 165.6 | 165.6 | 165.6 |
| Note 1: 4 symbols allocated to PDCCH for 1.4MHz channel bandwidth. 3 symbols allocated to PDCCH for all other channel bandwidths.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.  Note 3: The scheduled narrowband other than 1.4MHz and 3MHz channel bandwidth avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz and 3MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st, and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.  Note 5: 2 resource blocks allocated to MPDCCH. | | | | | | | |

Table A.3.2-3e: Fixed Reference Channel for Maximum input level for UE DL Category M2 (FDD and HD-FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 6) |  | 2 | 8 | 15 | 15 | 15 | 15 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame (Note 4) |  | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 3/5 | 3/5 | 1/2 | 1/2 | 1/2 | 1/2 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 3, 8 | Bits | 552 | 2280 | 4008 | 4008 | 4008 | 4008 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | N/A | N/A | 4008 | 4008 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3, 8 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 |  | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 3, 8 | Bits | 912 | 4032 | 7560 | 7560 | 7560 | 7560 |
| For Sub-Frames 0,1,2,5,7,9 |  | N/A | N/A | N/A | N/A | 7560 | 7560 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 110.4 | 456.0 | 801.6 | 801.6 | 3206.4 | 3206.4 |
| Max. Throughput averaged over 1 frame for HD-FDD |  | 55.2 | 228.0 | 400.8 | 400.8 | 1202.4 | 1202.4 |
| Note 1: 4 symbols allocated to PDCCH for 1.4MHz channel bandwidth. 3 symbols allocated to all other channel bandwidths.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.  Note 3: The scheduled wideband other than 1.4MHz/3MHz/5MHz/10MHz/ channel bandwidth avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.  Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz/3MHz/5MHz/10MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st, and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.  Note 5: 2 resource blocks allocated to MPDCCH.  Note 6: 2 resource blocks allocated to PDSCH for 1.4MHz channel bandwidth. 2 narrowbands and 4 resource blocks in each narrowband allocated to PDSCH for 3MHz channel bandwidth. For 5MHz/10MHz/15MHz/20MHz channel bandwidth, configure 3 narrowbands and 5 resource blocks in each narrowband allocated to PDSCH. | | | | | | | |

Table A.3.2-4 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| 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 4,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frames 1,6 | Bits | N/A | 6968 | 11448 | 23688 | 35160 | 46888 |
| 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 4,9 |  | 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 4,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frames 1,6 |  | N/A | 9828 | 16668 | 33768 | 50868 | 67968 |
| 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(0,4,5,9), 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 [4].  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 [4]. | | | | | | | |

Table A.3.2-4a Fixed Reference Channel for Maximum input level for UE Category 1 (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 18 | 17 | 17 | 17 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| 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 4,9 | Bits | 2984 | 8504 | 10296 | 10296 | 10296 | 10296 |
| For Sub-Frames 1,6 | Bits | N/A | 6968 | 8248 | 7480 | 7480 | 7480 |
| 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 | 8248 | 10296 | 10296 | 10296 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frames 1,6 |  | N/A | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 4104 | 11340 | 13608 | 14076 | 14076 | 14076 |
| For Sub-Frames 1,6 |  | N/A | 9828 | 11880 | 11628 | 11628 | 11628 |
| 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 | 11520 | 14076 | 14076 | 14076 |
| Max. Throughput averaged over 1 frame | kbps | 596.8 | 3791.2 | 4533.6 | 4584.8 | 4584.8 | 4584.8 |
| Note 1: For normal subframes(0,4,5,9), 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 [4].  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 [4]. | | | | | | | |

Table A.3.2-4b Fixed Reference Channel for Maximum input level for UE Category 2 (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 | 15 | 25 | 50 | 75 | 83 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| 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 4,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 51024 |
| For Sub-Frames 1,6 | Bits | N/A | 6968 | 11448 | 23688 | 35160 | 39232 |
| 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 | 51024 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 | 3 | 5 | 8 | 9 |
| For Sub-Frames 1,6 |  | N/A | 2 | 3 | 5 | 7 | 7 |
| 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 | 9 |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 68724 |
| For Sub-Frames 1,6 |  | N/A | 9828 | 16668 | 33768 | 50868 | 56340 |
| 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 | 16380 | 39312 | 60012 | 66636 |
| Max. Throughput averaged over 1 frame | kbps | 596.8 | 3791.2 | 6369.6 | 13910 | 20945 | 23154 |
| Note 1: For normal subframes(0,4,5,9), 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 [4].  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 [4]. | | | | | | | |

Table A.3.2-4c Fixed Reference Channel for Maximum input level for UE DL Category 0 (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| 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 4,9 | Bits | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frames 1,6 | Bits | N/A | 712 | 712 | 712 | 712 | 712 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 1000 | 1000 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 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 |  | N/A | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 1368 | 1512 | 1512 | 1656 | 1656 | 1656 |
| For Sub-Frames 1,6 |  | N/A | 1224 | 1224 | 1368 | 1368 | 1368 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 1512 | 1512 | 1656 | 1656 | 1656 |
| Max. Throughput averaged over 1 frame | kbps | 200 | 442.4 | 442.4 | 442.4 | 442.4 | 442.4 |
| Note 1: For normal subframes(0,4,5,9), 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 [4].  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 [4]. | | | | | | | |

Table A.3.2-4d Fixed Reference Channel for Maximum input level for UE Categories ≥ 3 (TDD Band 46)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 100 |
| Uplink-Downlink Configuration |  | N/A |
| Subcarriers per resource block |  | 12 |
| Allocated subframes per Radio Frame (D) |  | 8 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 3/4 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions |  | N/A |
| Information Bit Payload per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 61664 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 61664 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |
| For Sub-Frames 3,4,6,7,8,9 |  | 11 |
| For Sub-Frame 1,2 |  | N/A |
| For Sub-Frame 0,5 |  | 11 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 82800 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 81936 |
| Max. Throughput averaged over 1 frame | kbps | 49331.2 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz.  Note 2: Reference signal, Synchronization signals allocated as per TS 36.211 [4].  Note 3: 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). | | |

Table A.3.2-4e Fixed Reference Channel for Maximum input level for UE DL Category M1 (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 |
| 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 4,9 | Bits | 552 | 552 | 552 | 552 | 552 | 552 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 912 | 1008 | 1008 | 1008 | 1008 | 1008 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame | kbps | 110.4 | 110.4 | 110.4 | 110.4 | 110.4 | 110.4 |
| Note 1: For normal subframes(0,4,5,9), 4 symbols allocated to PDCCH for 1.4MHz channel bandwidth and 3 symbols allocated to PDCCH for all other channel bandwidths. 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 [4].  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 [4].  Note 6: 2 resource blocks allocated to MPDCCH. | | | | | | | |

Table A.3.2-4f: Fixed Reference Channel for Maximum input level for UE DL Category M2 (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 7) |  | 2 | 8 | 15 | 15 | 15 | 15 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 3/5 | 3/5 | 1/2 | 1/2 | 1/2 | 1/2 |
| 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 4,9 | Bits | 552 | 2280 | 4008 | 4008 | 4008 | 4008 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 912 | 4032 | 7560 | 7560 | 7560 | 7560 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame | kbps | 110.4 | 456.0 | 801.6 | 801.6 | 801.6 | 801.6 |
| Note 1: For normal subframes(0,4,5,9), 4 symbols allocated to PDCCH for 1.4MHz channel bandwidth, and 3 symbols allocated for all other channel bandwidths. 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 [4].  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 [4].  Note 6: 2 resource blocks allocated to MPDCCH.  Note 7: 2 resource blocks allocated to PDSCH for 1.4MHz channel bandwidth. 2 narrowbands and 4 resource blocks in each narrowband allocated to PDSCH for 3MHz channel bandwidth. For 5MHz/10MHz/15MHz/20MHz channel bandwidth, configure 3 narrowbands and 5 resource blocks in each narrowband allocated to PDSCH. | | | | | | | |

Table A.3.2-5 Fixed Reference Channel for Maximum input level for UE Categories 11/12 and UE DL categories ≥ 11 (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Allocated subframes per Radio Frame |  | 8 | 9 | 9 | 9 | 9 | 9 |
| 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 | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4392 | 12216 | 19848 | 42368 | 63776 | 84760 |
| 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 | 40576 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 2 | 4 | 7 | 11 | 14 |
| 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 1,2,3,4,6,7,8,9 | Bits | 5472 | 15120 | 25200 | 55200 | 82800 | 110400 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 12210 | 22290 | 51840 | 79440 | 107040 |
| Max. Throughput averaged over 1 frame | kbps | 3513.6 | 10764 | 17635.2 | 37952 | 57398.4 | 76284 |
| Note 1: 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.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.2-6 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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 4,9 | Bits | 4392 | 12216 | 19848 | 42368 | 63776 | 84760 |
| For Sub-Frames 1,6 | Bits | N/A | 10680 | 17568 | 36696 | 55056 | 75376 |
| 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 4,9 |  | 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 4,9 | Bits | 5472 | 15120 | 25200 | 55200 | 82800 | 110400 |
| For Sub-Frames 1,6 |  | N/A | 13104 | 22224 | 45024 | 67824 | 90624 |
| 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(0,4,5,9), 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 [4].  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 [4]. | | | | | | | |

Table A.3.2-7 Fixed Reference Channel for Maximum input level for UE Categories 11/12 and UE DL categories ≥ 11 (TDD Band 46)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 100 |
| Uplink-Downlink Configuration |  | N/A |
| Subcarriers per resource block |  | 12 |
| Allocated subframes per Radio Frame (D) |  | 8 |
| Modulation |  | 256QAM |
| Target Coding Rate |  | 4/5 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions |  | N/A |
| Information Bit Payload per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 84760 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 84760 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |
| For Sub-Frames 3,4,6,7,8,9 |  | 14 |
| For Sub-Frame 1,2 |  | N/A |
| For Sub-Frame 0,5 |  | 14 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 110400 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 109248 |
| Max. Throughput averaged over 1 frame | kbps | 67808 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz.  Note 2: Reference signal, Synchronization signals allocated as per TS 36.211 [4].  Note 3: 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). | | |

Table A.3.2-8 Fixed Reference Channel for Maximum input level for UE DL category 20 and UE DL categories ≥ 22 (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Allocated subframes per Radio Frame |  | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM | 1024QAM | 1024QAM | 1024QAM |
| Target Coding Rate |  | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 6456 | 15840 | 26416 | 55056 | 81176 | 110136 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 11832 | 21384 | 52752 | 78704 | 105528 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 2 | 3 | 5 | 9 | 14 | 18 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 4 | 9 | 13 | 18 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 7560 | 18900 | 31500 | 69000 | 103500 | 138000 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 14700 | 27300 | 64800 | 99300 | 133800 |
| Max. Throughput averaged over 1 frame | kbps | 5164.8 | 13855.2 | 23271.2 | 49320 | 72811.2 | 98661.6 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz, 3 MHz and 1.4 MHz.  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.2-9 Fixed Reference Channel for Maximum input level for UE DL category 20 and UE DL categories ≥ 22 (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) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame |  | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM | 1024QAM | 1024QAM | 1024QAM |
| 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 4,9 | Bits | 6456 | 15840 | 26416 | 55056 | 81176 | 110136 |
| For Sub-Frames 1,6 | Bits | N/A | 12960 | 22152 | 45352 | 66592 | 90816 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 12216 | 22920 | 52752 | 78704 | 105528 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 2 | 3 | 5 | 9 | 14 | 18 |
| For Sub-Frames 1,6 |  | N/A | 3 | 4 | 8 | 11 | 15 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 4 | 9 | 13 | 18 |
| Binary Channel Bits per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 7560 | 18900 | 31500 | 69000 | 103500 | 138000 |
| For Sub-Frames 1,6 |  | N/A | 16380 | 27780 | 56280 | 84780 | 113280 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 15420 | 28020 | 65520 | 100020 | 134520 |
| Max. Throughput averaged over 1 frame | kbps | 1291.2 | 6981.6 | 12005.6 | 25356.8 | 37424 | 50743.2 |
| Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz, 3 MHz and 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 [4].  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 [4]. | | | | | | | |

Table A.3.2-10 Fixed Reference Channel for Maximum input level for UE DL category 20 and UE DL categories ≥ 22 (TDD Band 46)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 100 |
| Uplink-Downlink Configuration |  | N/A |
| Subcarriers per resource block |  | 12 |
| Allocated subframes per Radio Frame (D) |  | 8 |
| Modulation |  | 1024QAM |
| Target Coding Rate |  | 4/5 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions |  | N/A |
| Information Bit Payload per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 110136 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 110136 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |
| For Sub-Frames 3,4,6,7,8,9 |  | 18 |
| For Sub-Frame 1,2 |  | N/A |
| For Sub-Frame 0,5 |  | 18 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 138000 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 136560 |
| Max. Throughput averaged over 1 frame | kbps | 88108.8 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz.  Note 2: Reference signal, Synchronization signals allocated as per TS 36.211 [4].  Note 3: 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). | | |

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

### A.3.3.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.4 FDD | R.42  FDD | R.42-1 FDD | R.42-2 FDD | R.42-3 FDD | R.2 FDD |
| Channel bandwidth | MHz | 1.4 | 20 | 3 | 5 | 15 | 10 |
| Allocated resource blocks (Note 4) |  | 6 | 100 | 15 | 25 | 75 | 50 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 |
| 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 (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 8760 | 1320 | 2216 | 6712 | 4392 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 152 | 8760 | 1064 | 1800 | 6712 | 4392 |
| Number of Code Blocks  (Notes 3 and 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 2 | 1 | 1 | 2 | 1 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 2 | 1 | 1 | 2 | 1 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 27600 | 3780 | 6300 | 20700 | 13800 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 528 | 26760 | 2940 | 5460 | 19860 | 12960 |
| Max. Throughput averaged over 1 frame  (Note 4) | Mbps | 0.342 | 7.884 | 1.162 | 1.953 | 6.041 | 3.953 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword. | | | | | | | |

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  |  | R.3-1 FDD | R.3 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Allocated subframes per Radio Frame |  |  |  | 9 | 9 |  |  |
| Modulation |  |  |  | 16QAM | 16QAM |  |  |
| Target Coding Rate |  |  |  | 1/2 | 1/2 |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 6456 | 14112 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 5736 | 12960 |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |  | 2 | 3 |  |  |
| For Sub-Frame 5 |  |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 |  |  |  | 1 | 3 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 12600 | 27600 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 10920 | 25920 |  |  |
| Max. Throughput averaged over 1 frame | Mbps |  |  | 5.738 | 12.586 |  |  |
| UE Category |  |  |  | ≥ 1 | ≥ 2 |  |  |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  | R.5 FDD | R.6 FDD | R.7 FDD | R.8 FDD | R.9 FDD |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  | 15 | 25 | 50 | 75 | 100 |
| Allocated subframes per Radio Frame |  |  | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 6456 | 12576 | 28336 | 45352 | 61664 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  | 2 | 3 | 5 | 8 | 11 |
| For Sub-Frame 5 |  |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  |  | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 8820 | 16380 | 38880 | 59580 | 80280 |
| Max. Throughput averaged over 1 frame | Mbps |  | 7.449 | 12.547 | 27.294 | 42.046 | 55.498 |
| UE Category |  |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.3.1-3a: Fixed Reference Channel 64QAM R=3/4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  | R.6-1 FDD | R.7-1 FDD | R.8-1 FDD | R.9-1 FDD | R.9-2 FDD |
| Channel bandwidth | MHz |  | 5 | 10 | 15 | 20 | 20 |
| Allocated resource blocks (Note 3) |  |  | 18 | 17 | 17 | 17 | 83 |
| Allocated subframes per Radio Frame |  |  | 9 | 9 | 9 | 9 | 9 |
| Modulation |  |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 10296 | 10296 | 10296 | 10296 | 51024 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 8248 | 10296 | 10296 | 10296 | 51024 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  | 2 | 2 | 2 | 2 | 9 |
| For Sub-Frame 5 |  |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  |  | 2 | 2 | 2 | 2 | 9 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 13608 | 14076 | 14076 | 14076 | 68724 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 11088 | 14076 | 14076 | 14076 | 66204 |
| Max. Throughput averaged over 1 frame | Mbps |  | 9.062 | 9.266 | 9.266 | 9.266 | 45.922 |
| UE Category |  |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: Localized allocation started from RB #0 is applied.  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). | | | | | | | |

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  | R.0 FDD |  | R.1 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10/20 | 15 | 20 |
| Allocated resource blocks |  |  | 1 |  | 1 |  |  |
| Allocated subframes per Radio Frame |  |  | 9 |  | 9 |  |  |
| Modulation |  |  | 16QAM |  | 16QAM |  |  |
| Target Coding Rate |  |  | 1/2 |  | 1/2 |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 224 |  | 256 |  |  |
| For Sub-Frame 5 | Bits |  | N/A |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  | 224 |  | 256 |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  | 1 |  | 1 |  |  |
| For Sub-Frame 5 |  |  | N/A |  | N/A |  |  |
| For Sub-Frame 0 |  |  | 1 |  | 1 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 504 |  | 552 |  |  |
| For Sub-Frame 5 | Bits |  | N/A |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  | 504 |  | 552 |  |  |
| Max. Throughput averaged over 1 frame | Mbps |  | 0.202 |  | 0.230 |  |  |
| UE Category |  |  | ≥ 1 |  | ≥ 1 |  |  |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.3.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.29 FDD (MBSFN) | R.29-1 FDD (MBSFN) |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks |  | 1 | 1 |
| MBSFN Configuration |  | 111111(Note 4) | 11111111(Note 5) |
| Allocated subframes per Radio Frame |  | 3 | 3 |
| Modulation |  | 16QAM | 16QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 4,9 | Bits | 256 | 0(MBSFN) |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | 256 | 256 |
| For Sub-Frame 1,2,3,6,7,8 | Bits | 0 (MBSFN) | 0 (MBSFN) |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 0(MBSFN) |
| For Sub-Frame 5 |  | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 1 |
| For Sub-Frame 1,2,3,6,7,8 |  | 0 (MBSFN) | 0 (MBSFN) |
| Binary Channel Bits Per Sub-Frame |  |  |  |
| For Sub-Frames 4,9 | Bits | 552 | 0(MBSFN) |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | 552 | 552 |
| For Sub-Frame 1,2,3,6,7,8 | Bits | 0 (MBSFN) | 0 (MBSFN) |
| Max. Throughput averaged over 1 frame | kbps | 76.8 | 25.6 |
| UE Category |  | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: MBSFN Subframe Allocation as defined in TS 36.331 [7], one frame with 6 bits is chosen for MBSFN subframe allocation  Note 5: MBSFN Subframe Allocation as defined in TS 36.331 [7], one frame with 6 bits and MBSFN Subframe Allocation-v14xy in TS 36.331 [7], one frame with 2 bits, are chosen for MBSFN subframe allocation. | | | |

Table A.3.3.1-6: Fixed Reference Channel QPSK R=1/10

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  |  |  | R.41 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 50 |  |  |
| Allocated subframes per Radio Frame |  |  |  |  | 9 |  |  |
| Modulation |  |  |  |  | QPSK |  |  |
| Target Coding Rate |  |  |  |  | 1/10 |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  |  | 1384 |  |  |
| For Sub-Frame 5 | Bits |  |  |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  |  | 1384 |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |  |  | 1 |  |  |
| For Sub-Frame 5 |  |  |  |  | N/A |  |  |
| For Sub-Frame 0 |  |  |  |  | 1 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  |  | 13800 |  |  |
| For Sub-Frame 5 | Bits |  |  |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  |  | 12960 |  |  |
| Max. Throughput averaged over 1 frame | Mbps |  |  |  | 1.246 |  |  |
| UE Category |  |  |  |  | ≥ 1 |  |  |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.3.1-7: Fixed Reference Channel for CA demodulation with power imbalance

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | R.49 FDD | R.49-1 FDD | R.49-2 FDD |
| Channel bandwidth | MHz | 20 | 10 | 5 |
| Allocated resource blocks |  | 100 | 50 | 25 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 |
| Modulation |  | 64QAM | 64QAM | 64QAM |
| Coding Rate |  |  |  |  |
| For Sub-Frame 1,2,3,4,6,7,8,9, |  | 0.84 | 0.84 | 0.84 |
| For Sub-Frame 5 |  | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 0.87 | 0.87 | 0.86 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 63776 | 31704 | 15840 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 63776 | 30576 | 14112 |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,6,7,8,9 | Code Blocks | 11 | 6 | 3 |
| For Sub-Frame 5 | Code Blocks | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  | 5 | 3 |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 75600 |  |  |
| For Sub-Frame 5 | Bits | N/A | 37800 | 18900 |
| For Sub-Frame 0 | Bits | 73080 | N/A | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 57.398 | 35280 | 16380 |
| UE Category |  | ≥5 | ≥2 | ≥2 |
| Note 1: 3 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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). | | | | |

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

#### A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | |
| Reference channel |  | R.10 FDD | R.11 FDD | R.11-1 FDD | R.11-2 FDD | R.11-3 FDD Note 5 | R.11-4 FDD | R.30 FDD | R.30-1 FDD | R.35-1 FDD | R.35 FDD | R.35-2 FDD | R.35-3 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 10 | 10 | 20 | 15 | 20 | 10 | 15 | 10 |
| Allocated resource blocks (Note 4) |  | 50 | 50 | 50 | 25 | 40 | 50 | 100 | 75 | 100 | 50 | 75 | 50 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 8 | 9 | 9 | 9 | 9 | 8 | 8 | 9 | 8 | 8 |
| Modulation |  | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.39 | 1/2 | 0.39 | 0.39 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4392 | 12960 | 12960 | 5736 | 10296 | 6968 | 25456 | 19080 | 30576 | 19848 | 22920 | 15264 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 4392 | 12960 | N/A | 4968 | 10296 | 6968 | 25456 | N/A | N/A | 18336 | N/A | N/A |
| Number of Code Blocks  (Notes 3 and 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 3 | 3 | 1 | 2 | 2 | 5 | 4 | 5 | 4 | 4 | 3 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 1 | 3 | N/A | 1 | 2 | 2 | 5 | N/A | N/A | 3 | N/A | N/A |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 13200 | 26400 | 26400 | 12000 | 21120 | 13200 | 52800 | 39600 | 79200 | 39600 | 59400 | 39600 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 12384 | 24768 | N/A | 10368 | 19488 | 12384 | 51168 | N/A | N/A | 37152 | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 3.953 | 11.664 | 10.368 | 5.086 | 9.266 | 6.271 | 22.910 | 15.264 | 24.461 | 17.712 | 18.336 | 12.211 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | 4 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: For R.11-3 resource blocks of RB6–RB45 are allocated. | | | | | | | | | | | | | |

Table A.3.3.2.1-2: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | |
| Reference channel |  | R.46 FDD | R.47 FDD | R.35-4 FDD | R.11-5 FDD | R.11-6 FDD | R.11-7 FDD | R.11-8 FDD | R.11- 9 FDD | R.11- 10 FDD | R.65 FDD | R.10-2 FDD | R.10-3 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 1.4 | 3 | 15 | 10 | 10 | 10 | 10 | 5 | 10 |
| Allocated resource blocks (Note 4) |  | 50 | 50 | 50 | 6 | 15 | 75 | 50 | 50 | 50 | 50 | 25 | 50 |
| Allocated number of PDCCH symbols |  | 2 | 2 | 2 | 4 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 8 | 9 | 9 | 9 | 8 | 8 | 8 | 9 | 9 |
| Modulation |  | QPSK | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | QPSK | QPSK | QPSK | 256QAM | QPSK | 16QAM |
| Target Coding Rate |  |  |  | 0.47 | 1/2 | 1/2 | 1/2 | 3/5 | 0.58 | 0.67 | 0. 55 | 1/3 | 0.58 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 5160 | 8760 | 18336 | 1352 | 3368 | 19080 | 7992 | 6968 | 7992 | 31704 | 1800 | 15264 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | n/a | n/a |
| For Sub-Frame 0 | Bits | 5160 | 8760 | 16416 | N/A | 2664 | 19080 | 6968 | N/A | N/A | N/A | 1800 | 14112 |
| Number of Code Blocks  (Notes 3 and 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 2 | 3 | 1 | 1 | 4 | 2 | 2 | 2 | 6 | 1 | 3 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | n/a | n/a |
| For Sub-Frame 0 | Bits | 1 | 2 | 3 | 1 | 1 | 4 | 2 | N/A | N/A | N/A | 1 | 3 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 13200 | 26400 | 39600 | 2592 | 7200 | 39600 | 13200 | 12000 | 12000 | 57600 | 6000 | 26400 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | n/a | n/a |
| For Sub-Frame 0 | Bits | 12384 | 24768 | 37152 | N/A | 5568 | 37968 | 12384 | N/A | N/A | N/A | 5184 | 24768 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 4.644 | 7.884 | 16.310 | 1.082 | 2.961 | 17.172 | 7.0904 | 5.5744 | 6.3936 | 25.363 | 1.620 | 13.6224 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | 11-12 | ≥ 1 | ≥ 2 |
| UE DL Category |  | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 |  |  | ≥ 11 | ≥ 6 |  |
| Note 1: Void  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: 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 4: Given per component carrier per codeword. | | | | | | | | | | | | | |

Table A.3.3.2.1-3: Fixed Reference Channel two antenna ports

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.62 FDD | R.63 FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 3 | 1 |
| Allocated DL subframes per 4 Radio Frames (Note 3) |  | 15 | 15 |
| Modulation |  | 16QAM | 64QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 744 | 408 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1584 | 792 |
| Max. Throughput averaged over 4 frames | Mbps | 0.279 | 0.153 |
| UE DL Category |  | 0 | 0 |
| 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, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.  Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | | |

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 DL subframes per Radio Frame |  | Note 3 | Note 5 | Note 3  Note 6 |
| Allocated DL subframes per Radio Frame |  | Note 3 | Note 5 | Note 3 |
| 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. | | | | |

Table A.3.3.2.1-5: Fixed Reference Channel two antenna ports

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Values | | |
| Reference channel |  | R.81 FDD | R.81-1 FDD | R.81-2 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 6 | 6 | 6 |
| Allocated PDSCH subframes |  | (Note 3) | (Note 6) | (Note 7) |
| Modulation |  | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/10 | 1/10 | 1/10 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 152 | 152 | 152 |
| 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 | 1584 | 1584 |
| Max. Throughput averaged over one period | kbps | 0.950 | 1.9 | 4.75 |
| UE DL Category |  | M1, ≥ 0 | ≥1 | ≥1 |
| Note 1: 2 symbols allocated to PDCCH  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: PDSCH subframes are scheduled at the 65th to 128th subframes every period=160 ms. Information bit payload is available at the 65th to 128th subframes with repetition. (Starting from the 0th subframe)  Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.  Note 5: MPDCCH are scheduled at the 0th to 63rd subframes with repetition. The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. (Starting from the 0th subframe)  Note 6: PDSCH subframes are scheduled at the 33th to 64th subframes every period=80 ms. Information bit payload is available at the 33th to 64th subframes with repetition. (Starting from the 0th subframe)  Note 7: PDSCH subframes are scheduled at the 9th to 24th subframes every period=32 ms. Information bit payload is available at the 9th to 24th subframes with repetition. (Starting from the 0th subframe) | | | | |

Table A.3.3.2.1-6: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Values | | | | | | | |
| Reference channel |  | R.87 FDD | R.87-1 FDD | R.84 FDD | R.aa FDD | R.bb FDD | R.87-2 FDD | R.87-3 FDD | R.87-4 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 5 | 15 | 20 |
| Allocated resource blocks (Note 4) |  | 50 | 50 | 39 | 50 | 50 | 25 | 75 | 100 |
| Allocated number of PDCCH symbols |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Allocated subframes per Radio subframes |  | 8 | 8 | 9 | 9 | 9 | 8 | 8 | 8 |
| Modulation |  | 64QAM | 16QAM | 16QAM | QPSK | 16QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 0.39 | 0.44 | 1/2 | 0.6 | 0.3 | 0.39 | 0.39 | 0.39 |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 0 |  | N/A | N/A | N/A | 0.65 | 0.32 | N/A | N/A | N/A |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 15264 | 11448 | 9912 | 7992 | 7992 | 7736 | 22920 | 30576 |
| For Sub-Frames 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 0 |  | N/A | N/A | 9912 | 7992 | 7992 | N/A | N/A | N/A |
| Number of Code Blocks(Notes 3 and 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 3 | 2 | 2 | 2 | 2 | 2 | 4 | 5 |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 0 |  | N/A | N/A | 2 | 2 | 2 | N/A | N/A | N/A |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 39600 | 26400 | 20592 | 13200 | 26400 | 19800 | 59400 | 79200 |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 0 |  | N/A | N/A | 20592 | 12384 | 24768 | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 12.211 | 9.158 | 8.9208 | 7.1928 | 7.1928 | 6.1888 | 18.336 | 24.461 |
| UE Category |  | ≥ 1 | ≥ 1 | 1bis | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 |
| UE DL Category |  | ≥ 6 | ≥ 6 | N/A | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 |
| Note 1: Void  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: 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 4: Given per component carrier per codeword.  Note 5: For R.84 FDD, 39 RBs are allocated on RB 0-20 and 30-47. | | | | | | | | | |

Table A.3.3.2.1-7: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.47-1 FDD | R.47-2 FDD | R.47-3 FDD |  |
| Channel bandwidth | MHz | 5 | 15 | 20 |  |
| Allocated resource blocks (Note 4) |  | 25 | 75 | 100 |  |
| Allocated number of PDCCH symbols |  | 2 | 2 | 2 |  |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 |  |
| Modulation |  | 16QAM | 16QAM | 16QAM |  |
| Target Coding Rate |  |  |  |  |  |
| Information Bit Payload (Note 4) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4008 | 12960 | 17568 |  |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |  |
| For Sub-Frame 0 | Bits | 3496 | 12960 | 17568 |  |
| Number of Code Blocks |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 3 | 3 |  |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |  |
| For Sub-Frame 0 | Bits | 1 | 3 | 3 |  |
| Binary Channel Bits (Note 3) |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 12000 | 39600 | 52800 |  |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |  |
| For Sub-Frame 0 | Bits | 10368 | 37968 | 51168 |  |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 3.556 | 11.664 | 15.8112 |  |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 |  |
| UE DL Category |  | ≥ 6 | ≥ 6 | ≥ 6 |  |
| Note 1: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 2: 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 3: Given per component carrier per codeword. | | | | | |

Table A.3.3.2.1-8: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Values | | | |
| Reference channel |  | R.90 FDD | R.91 FDD | R.92-1 FDD | R.92-2 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 18 (Note 7) | 18 (Note 7) | 36 (Note 8) | 36 (Note 8) |
| Allocated DL subframes |  | Note 3 | Note 4 | Note 5 | Note 6 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/10 | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1544 | 488 | 4392 | 4392 |
| Number of Code Blocks |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 | 1 | 1 | 1 |
| Binary Channel Bits |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 4752 | 4752 | 9504 | 9504 |
| Max. Throughput averaged over one period | kbps | 48.25 | 3.8125 | 219.6 | 439.2 |
| UE DL Category |  | M2 | M2 | ≥ 1 | ≥ 1 |
| 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 to 24th subframes every period=32 ms. Information bit payload is available at the 17th to 24th subframes with repetition. MPDCCH are scheduled at the 0th to 15th subframes with repetition. (Starting from the 0th subframe)  Note 4: The downlink subframes are scheduled at the 0th to 96th subframes every period=128 ms. Information bit payload is available at the 65th to 96th subframes with repetition. MPDCCH are scheduled at the 0th to 63rd subframes with repetition. (Starting from the 0th subframe)  Note 5: The downlink subframes are scheduled at the 0th to 12th subframes every period= 20 ms. Information bit payload is available at the 9th to 12th subframes with repetition. MPDCCH are scheduled at the 0th to 7th subframes with repetition. (Starting from the 0th subframe)  Note 6: The downlink subframes are scheduled at the 0th to 4th subframes every period=10 ms. Information bit payload is available at the 3rd to 4th subframes with repetition. MPDCCH are scheduled at the 0th to 1st subframes with repetition. (Starting from the 0th subframe)  Note 7: Allocated PRB positions are {0, 1, …, 17} within the assigned wideband.  Note 8: Allocated PRB positions are {1, 2, 3, …, 18, 31, 32, …, 48}.  Note 9: Allocated PRB positions for MPDCCH are {0, 1, 2, 3, 4, 5} within the scheduled narrowband. | | | | | | |

Table A.3.3.2.1-9: Fixed Reference Channel two antenna ports

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.11-13 FDD |  |
| Channel bandwidth | MHz | 10 |  |
| Allocated resource blocks (Note 4) |  | 50 |  |
| Allocated subframes per Radio Frame |  | 9 |  |
| Modulation |  | 16QAM |  |
| Target Coding Rate |  | 1/2 |  |
| Information Bit Payload (Note 4) |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10680 |  |
| For Sub-Frame 5 | Bits | N/A |  |
| For Sub-Frame 0 | Bits | 10680 |  |
| Number of Code Blocks  (Notes 3 and 4) |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2 |  |
| For Sub-Frame 5 | Bits | N/A |  |
| For Sub-Frame 0 | Bits | 2 |  |
| Binary Channel Bits (Note 4) |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 21648 |  |
| For Sub-Frame 5 | Bits | N/A |  |
| For Sub-Frame 0 | Bits | 17424 |  |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 9.612 |  |
| UE Category |  | ≥ 2 |  |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0,1,2,3,4,6,7,8,9. | | | |

#### A.3.3.2.2 Four antenna ports

Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | |
| Reference channel |  | R.12 FDD | R.13 FDD | R.14 FDD | R.14-1 FDD | R.14-2 FDD | R.14-3 FDD | R.36 FDD | R.14-4 FDD | R.14-5 FDD | R.14-6 FDD | R.14-7 FDD | R.36-1 FDD |
| Channel bandwidth | MHz | 1.4 | 10 | 10 | 10 | 10 | 20 | 10 | 1.4 | 3 | 5 | 15 | 10 |
| Allocated resource blocks (Note 4) |  | 6 | 50 | 50 | 6 | 3 | 100 | 50 | 6 | 15 | 25 | 75 | 50 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 8 | 8 | 9 | 9 | 8 | 9 | 9 | 9 | 9 |
| Modulation |  | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.55 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 4392 | 12960 | 1544 | 744 | 25456 | 18336 | 1192 | 3368 | 5736 | 19080 | 21384 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 152 | 3624 | 11448 | N/A | N/A | 22920 | 18336 | N/A | 2664 | 4968 | 19080 | 19848 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 1 | 3 | 1 | 1 | 5 | 3 | 1 | 1 | 1 | 4 | 4 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 1 | 2 | N/A | N/A | 4 | 3 | N/A | 1 | 1 | 4 | 4 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1248 | 12800 | 25600 | 3072 | 1536 | 51200 | 38400 | 2496 | 6960 | 11600 | 38400 | 38400 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 480 | 12032 | 24064 | N/A | N/A | 49664 | 36096 | N/A | 5424 | 10064 | 36864 | 36096 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 0.342 | 3.876 | 11.513 | 1.235 | 0.595 | 22.656 | 16.502 | 0.954 | 2.961 | 5.086 | 17.172 | 19.092 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword. | | | | | | | | | | | | | |

Table A.3.3.2.2-2: Fixed Reference Channel four antenna ports

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | |
| Reference channel |  | R.72 FDD | R.72-1 FDD | R.72-2 FDD | R.72-3 FDD | R.73 FDD | R.73-1 FDD | R.74 FDD | R.85 FDD | R.93 FDD |
| Channel bandwidth | MHz | 10 | 5 | 15 | 20 | 10 | 10 | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 50 | 25 | 75 | 100 | 50 | 50 | 50 | 24  (Note 5) | 24  (Note 5) |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 64QAM | 16QAM | 16QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 0.62 | 0.69 | 0.61 | 0.62 | 0.43 | 1/2 | 1/2 | 1/2 | 0.52 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 31704 | 15840 | 46888 | 63776 | 16416 (CW0)  32856 (CW1) | 12960  (CW0)  25456  (CW1) | 25456 | 10296 | 9528 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 31704 | 15840 | 46888 | 63776 | 15264 (CW0)  30576 (CW1) | 11448  (CW0)  22920  (CW1) | 22920 | 10296 | 9528 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 6 | 3 | 8 | 11 | 3 (CW0)  6 (CW1) | 3 (CW0)  5 (CW1) | 5 | 2 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 6 | 3 | 8 | 11 | 3 (CW0)  5 (CW1) | 2 (CW0)  4 (CW1) | 5 | 2 | 2 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 51200 | 23200 | 76800 | 102400 | 38400 (CW0)  76800 (CW1) | 25600 (CW0)  51200 (CW1) | 51200 | 18432 | 18432 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 48128 | 20128 | 73728 | 99328 | 36096 (CW0)  72192 (CW1) | 24064 (CW0)  48128 (CW1) | 48128 | 18432 | 18432 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 28.534 | 14.256 | 42.1992 | 57.3984 | 14.659 (CW0)  29.342 (CW1) | 11.513  (CW0)  22.657 (CW1) | 22.657 | 9.2664 | 8.575 |
| UE Category |  | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 5 | ≥ 5 | ≥ 5 | 1bis | 1bis |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: 24 resource blocks (RB 0-20 and 30-32) are allocated in sub-frames 0, 1, 2, 3, 4, 6, 7, 8, 9 | | | | | | | | | | |

Table A.3.3.2.2-3: Fixed Reference Channel four antenna ports

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  |  | R.74-1 FDD | R.74-2 FDD | R.74-3 FDD | R.101 FDD |
| Channel bandwidth | MHz |  | 5 | 15 | 20 | 10 |
| Allocated resource blocks (Note 4) |  |  | 25 | 75 | 100 | 50 |
| Allocated subframes per Radio Frame |  |  | 9 | 9 | 9 | 9 |
| Modulation |  |  | 16QAM | 16QAM | 16QAM | 1024QAM |
| Target Coding Rate |  |  | 1/2 | 1/2 | 1/2 | 3/4 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 11448 | 37888 | 51024 | 52752 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 9912 | 37888 | 51024 | N/A |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  | 2 | 7 | 9 | 9 |
| For Sub-Frame 5 |  |  | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  |  | 2 | 7 | 9 | N/A |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 23200 | 76800 | 102400 | 68000 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 20128 | 73728 | 99328 | N/A |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps |  | 10.1496 | 34.0992 | 45.9216 | 42.2016 |
| UE Category |  |  | ≥ 5 | ≥ 5 | ≥ 5 | TBD |
| UE DL Category |  |  |  |  |  | 20, ≥ 22 |
| Note 1: 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. 1 symbol allocated to PDCCH for reference channel with 1024QAM.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword. | | | | | | |

Table A.3.3.2.2-4: Fixed Reference Channel four antenna ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Values |
| Reference channel |  | R.95 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) |  | 3 |
| Allocated DL subframes per Radio Frame (Note 3) |  | 2 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 744 |
| Number of Code Blocks |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 |
| Binary Channel Bits |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1536 |
| Max. Throughput averaged over 1 frame | Mbps | 0.149 |
| UE DL Category |  | 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. | | |

### A.3.3.3 Reference Measurement Channel for UE-Specific Reference Symbols

#### A.3.3.3.0 Two antenna ports (no CSI-RS)

The reference measurement channels in Table A.3.3.3.0-1 apply with two CRS antenna ports and without CSI-RS.

Table A.3.3.3.0-1: Fixed Reference Channel without CSI-RS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | |
| Reference channel |  | R.70 FDD | | R.71 FDD | | |
| Channel bandwidth | MHz | 10 | | 10 | | |
| Allocated resource blocks |  | 50 | | 50 | | |
| Allocated subframes per Radio Frame |  | 10 | | 10 | | |
| Modulation |  | QPSK | | 16QAM | | |
| Target Coding Rate |  | 0.65 | | 0.6 | | |
| Information Bit Payload |  |  | |  | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 6968 | | 12960 | | |
| For Sub-Frame 5 | Bits | N/A | | N/A | | |
| For Sub-Frame 0 | Bits | N/A | | N/A | | |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  | |  | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 2 | | 3 | | |
| For Sub-Frame 5 |  | N/A | | N/A | | |
| For Sub-Frame 0 |  | N/A | | N/A | | |
| Binary Channel Bits Per Sub-Frame |  |  | |  | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10800 | | 21600 | | |
| For Sub-Frame 5 | Bits | N/A | | N/A | | |
| For Sub-Frame 0 | Bits | N/A | | N/A | | |
| Max. Throughput averaged over 1 frame | Mbps | 5.5744 | | 10.368 | | |
| UE Category |  | ≥ 1 | | ≥ 2 | | |
| Note 1: 3 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: 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) | | | | | |

The reference measurement channels in Table A.3.3.3.0-2 apply for verifying demodulation performance for UE-specific reference symbols without CSI-RS.

Table A.3.3.3.0-2: Fixed Reference Channel without CSI-RS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.80 FDD | R.80-1 FDD | R.80-2 FDD | |
| Channel bandwidth | MHz | 10 | 10 | 10 | |
| Allocated resource blocks (Note 4) |  | 6 | 6 | 6 | |
| Allocated PDSCH subframes |  | Note 3 | Note 6 | Note 7 | |
| Modulation |  | QPSK | QPSK | QPSK | |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | |
| Information Bit Payload |  |  |  |  | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 504 | 504 | 504 | |
| 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 | 1440 | 1440 | 1440 | |
| Max. Throughput averaged over one period | kbps | 15.75 | 31.5 | 50.4 | |
| UE DL Category |  | M1, ≥ 0 | ≥1 | ≥1 | |
| Note 1: 2 symbols allocated to PDCCH  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: PDSCH subframes are scheduled at the 9th to 16th subframes every period=32 ms. Information bit payload is availabled from the 9-th to 16th subframes with repetition. (Starting from the 0th subframe)  Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.  Note 5: MPDCCH are scheduled at the 0th to 7th subframes with repetition. The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. (Starting from the 0th subframe)  Note 6: PDSCH subframes are scheduled at the 3th to 6th subframes every period=16 ms. Information bit payload is availabled from the 3th to 6th subframes with repetition. (Starting from the 0th subframe)  Note 7: PDSCH subframes are scheduled at the 2th to 3th subframes every period=10 ms. Information bit payload is availabled from the 2th to 3th subframes with repetition. (Starting from the 0th subframe) | | | | | |

#### A.3.3.3.1 Two antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

Table A.3.3.3.1-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | |
| Reference channel |  | R.51 FDD | R.51-1 FDD | R.76 FDD | R.51-2 FDD | R.51-3 FDD | R.51-4 FDD | R.86 FDD | R.86A FDD | R.X FDD | R.94 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 15 | 20 | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 25 (Note 5) | 75 (Note 6) | 100 (Note 7) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 24 (Note 8) |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 16QAM | QPSK | QPSK | 64QAM | QPSK |
| Target Coding Rate |  | 1/2 | 0.54 |  | 1/2 | 1/2 | 1/2 | 1/3 | 1/3 | 1/2 | 2/3 |
| Information Bit Payload |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 11448 | 12960 | 6200 | 5736 | 16992 | 22920 | 4392 | 3624 | 18336 | 3752 |
| For Sub-Frames 2,3,7,8 | Bits | 11448 | 12960 | 6200 | 5736 | 16992 | 22920 | 4392 | 3624 | 18336 | 3752 |
| For Sub-Frame 5 | Bits | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9528 | 10680 | 4968 | 3880 | 14112 | 19848 | 3624 | 2984 | 14688 | 3752 |
| Number of Code Blocks (Note 4) |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Code blocks | 2 | 3 | 2 | 1 | 3 | 4 | 1 | 1 | 3 | 1 |
| For Sub-Frames 2,3,7,8 | Code blocks | 2 | 3 | 2 | 1 | 3 | 4 | 1 | 1 | 3 | 1 |
| For Sub-Frame 5 | Bits | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| ­­ For Sub-Frame 0 | Bits | 2 | 2 | 1 | 1 | 3 | 4 | 1 | 1 | 3 | 1 |
| Binary Channel Bits |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 24000 | 24000 | 12000 | 10800 | 36000 | 48000 | 12000 | 11600 | 36000 | 5760 |
| For Sub-Frames 2,7 |  | 23600 | 23600 | 11800 | 10600 | 35400 | 47200 | 11800 | 11600 | 35400 | 5664 |
| For Sub-Frames 3,8 |  | 23200 | 23200 | 12000 | 10400 | 34800 | 46400 | 11600 | 11200 | 34800 | 5568 |
| For Sub-Frame 5 | Bits | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 19680 | 9840 | 6912 | 30240 | 42240 | 11184 | 9512 | 29520 | 5760 |
| Max. Throughput averaged over 1 frame | Mbps | 10.1112 | 11.436 | 5.4568 | 4.9768 | 15.0048 | 20.3208 | 3.876 | 3.1976 | 16.138 | 3.376 |
| UE Category |  | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | 1bis | ≥ 1 | ≥ 2 | 1bis |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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: 25 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0.  Note 6: 75 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0.  Note 7: 100 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0.  Note 8: 24 resource blocks (RB 0-20 and 30-32) are allocated in sub-frames 0, 1, 2, 3, 4, 6, 7, 8, 9 | | | | | | | | | | | |

The reference measurement channels in Table A3.3.3.1-2 apply for verifying demudlation performance for UE-specific reference symbols with two cell specific antenna ports and two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS in same subframe.

Table A.3.3.3.1-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.52 FDD | R.52-1 FDD | R.53 FDD | R.54 FDD | R.97 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | 16QAM | 64QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 1/2 | 0.54 | 1/2 | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |  |  |  |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 18336 | 12960 | 18336 | 11448 | 11448 |
| For Sub-Frames 2,7 | Bits | 16416 | 12960 | 16416 | 11448 | 11448 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 14688 | 10680 | 14688 | 9528 | 9528 |
| Number of Code Blocks (Note 4) |  |  |  |  |  |  |
| For Sub-Frames 1,3,4,6,8,9 | Code blocks | 3 | 3 | 3 | 2 | 2 |
| For Sub-Frames 2, 7 | Code blocks | 3 | 3 | 3 | 2 | 2 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 3 | 2 | 3 | 2 | 2 |
| Binary Channel Bits |  |  |  |  |  |  |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 36000 | 24000 | 36000 | 24000 | 24000 |
| For Sub-Frames 2,7 |  | 34200 | 22800 | 33600 | 22800 | 22400 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 29520 | 19680 | 29520 | 19680 | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 15.7536 | 11.436 | 15.7536 | 10.1112 | 10.1112 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | | | | | |

Table A.3.3.3.1-3: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.76-1 FDD | R.76-2 FDD | R.76-3 FDD | R.76-4 FDD | R.76-5 FDD | R.76-6 FDD | R.76-7 FDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 25 (Note 5) | 75 (Note 6) | 100 (Note 7) | 25 (Note 5) | 50 (Note 3) | 75 (Note 6) | 100 (Note 7) |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  |  |  |  |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 2600 | 9144 | 12216 | 3496 | 7992 | 11832 | 15840 |
| For Sub-Frames 2,3,7,8 | Bits | 2600 | 9144 | 12216 | 3496 | 7992 | 11832 | 15840 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 1736 | 7736 | 10680 | 2344 | 6456 | 9912 | 14112 |
| Number of Code Blocks (Note 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| For Sub-Frames 2,3,7,8 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| ­­ For Sub-Frame 0 | Bits | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| Binary Channel Bits |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 5400 | 18000 | 24000 | 5400 | 12000 | 18000 | 24000 |
| For Sub-Frames 2,7 |  | 5300 | 17700 | 23600 | 5300 | 11800 | 17700 | 23600 |
| For Sub-Frames 3,8 |  | 5200 | 17400 | 23200 | 5200 | 12000 | 17400 | 23200 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 3456 | 15120 | 21120 | 3456 | 9840 | 15120 | 21120 |
| Max. Throughput averaged over 1 frame | Mbps | 2.2536 | 8.0888 | 10.8408 | 3.0312 | 7.0392 | 10.4568 | 14.0832 |
| UE Category |  | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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: 25 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0.  Note 6: 75 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0.  Note 7: 100 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0.  Note 8: Given per component carrier per codeword. | | | | | | | | |

#### A.3.3.3.2 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.3.3.2-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | |
| Reference channel |  | R.43 FDD | R.43-1 FDD | R.43-2 FDD | R.50 FDD | R.48 FDD | R.66 FDD | R.75 FDD | R.75A FDD | R.cc FDD | R.45A-1 FDD | R.102 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 3) | 50 (Note 3) | 50 (Note 5) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50  (Note 3) |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | QPSK | QPSK | QPSK | 64QAM | QPSK | 256QAM | 16QAM | 16QAM | 16QAM | 16QAM | 1024QAM |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/2 |  | 0.77 | 0.57 | 0.51 | 0.64 | 1/2 | 3/4 |
| Information Bit Payload |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 3624 | 3624 | 3624 | 18336 | 6200 | 36696 | 25456 | 25456 | 15264 | 11448 | 52752 |
| For Sub-Frames 2,3,7,8 | Bits | 3624 | 3624 | 3624 | 16416 | 6200 | 35160 | 25456 | 25456 | 15264 | 11448 | 52752 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 2984 | 2984 | 3368 | 14688 | 4968 | 30576 | 21384 | 21384 | 12576 | 9528 | N/A |
| Number of Code Blocks (Note 4) |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,4,6,9 | Code blocks | 1 | 1 | 1 | 3 | 2 | 6 | 5 | 5 | 3 | 2 | 9 |
| For Sub-Frames 2,3,7,8 | Code blocks | 1 | 1 | 1 | 3 | 2 | 6 | 5 | 5 | 3 | 2 | 9 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 1 | 1 | 1 | 3 | 1 | 5 | 4 | 4 | 3 | 2 | N/A |
| Binary Channel Bits |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,6 | Bits | 12000 | 13200 | 13200 | 36000 | 12000 | 48000 | 43200 | 48000 | 24000 | 24000 | 66000 |
| For Sub-Frames 4,9 | Bits | 12000 | 12000 | 12000 | 36000 | 12000 | 48000 | 43200 | 48000 | 24000 | 24000 | 66000 |
| For Sub-Frames 2,7 | Bits | 11600 | 12800 | 12800 | 34800 | 11600 | 46400 | 41600 | 46400 | 23200 | 23200 | 64000 |
| For Sub-Frames 3,8 | Bits | 11600 | 12800 | 12800 | 34800 | 12000 | 46400 | 41600 | 46400 | 23200 | 23200 | 66000 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9840 | 9840 | 10560 | 29520 | 9840 | 39360 | 35424 | 40224 | 19680 | 19680 | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 3.1976 | 3.1976 | 3.236 | 15.3696 | 5.4568 | 31.800 | 22.503 | 22.503 | 13.4688 | 10.1112 | 46.5832 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | 11-12 | ≥ 5 | ≥ 5 | ≥ 2 | ≥ 2 | TBD |
| UE DL Category |  | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 11 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | 20, ≥ 22 |
| Note 1: 2 symbols allocated to PDCCH. 1 symbol allocated to PDCCH for reference channel with 1024QAM.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 47 resource blocks (RB0–RB23 and RB27–RB49) are allocated in sub-frame 0. In sub-frame 0, PDSCH is rate matched around RB22, RB23 and RB27. | | | | | | | | | | | | |

The reference measurement channels in Table A.3.3.3.2-2 apply for verifying FDD PMI accuracy measurement and CRI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-2: Fixed Reference Channel for four antenna ports (CSI-RS)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | | | Unit | | | Value | | | | | | |
| Reference channel | |  | | R.44  FDD | | R.45  FDD | | | R.45-1  FDD | | | R.60 FDD | | R.50A -1 FDD | | R.45A-2 FDD | |
| Channel bandwidth | | MHz | | 10 | | 10 | | | 10 | | | 10 | | 10 | | 10 | |
| Allocated resource blocks | |  | | 503 | | 503 | | | 39 | | | 503 | | 503 | | 503 | |
| Allocated subframes per Radio Frame | |  | | 10 | | 10 | | | 10 | | | 10 | | 7 | | 10 | |
| Modulation | |  | | QPSK | | 16QAM | | | 16QAM | | | QPSK | | 64QAM | | 16QAM | |
| Target Coding Rate | |  | | 1/3 | | 1/2 | | | 1/2 | | | 1/2 | | 1/2 | | 1/2 | |
| Information Bit Payload | |  | |  | |  | | |  | | |  | |  | |  | |
| For Sub-Frames (Non CSI-RS subframe) | | Bits | | 3624 | | 11448 | | | 8760 | | | 6200 | | 18336 | | 11448 | |
| For Sub-Frames (CSI-RS subframe) | | Bits | | 3624 | | 11448 | | | 8760 | | | 6200 | | N/A | | 11448 | |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | | Bits | | N/A | | N/A | | | N/A | | | N/A | | N/A | | N/A |
| For Sub-Frame 5 | | Bits | | N/A | | N/A | | | N/A | | | N/A | | N/A | | N/A | |
| For Sub-Frame 0 | | Bits | | 2984 | | 9528 | | | 8760 | | | N/A | | 14688 | | 9528 | |
| Number of Code Blocks per Sub-Frame (Note 4) | |  | |  | |  | | |  | | |  | |  | |  | |
| For Sub-Frames (Non CSI-RS subframe) | |  | | 1 | | 2 | | | 2 | | | 2 | | 3 | | 2 | |
| For Sub-Frames (CSI-RS subframe) | |  | | 1 | | 2 | | | 2 | | | 2 | | N/A | | 2 | |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | | Bits | | N/A | | N/A | | | N/A | | | N/A | | N/A | | N/A | |
| For Sub-Frame 5 | |  | | N/A | | N/A | | | N/A | | | N/A | | N/A | | N/A | |
| For Sub-Frame 0 | |  | | 1 | | 2 | | | 2 | | | N/A | | 3 | | 2 | |
| Binary Channel Bits Per Sub-Frame | |  | |  | |  | | |  | | |  | |  | |  | |
| For Sub-Frames (Non CSI-RS subframe) | | Bits | | 12000 | | 24000 | | | 18720 | | | 12000 | | 36000 | | 24000 | |
| For Sub-Frames (CSI-RS subframe) | | Bits | | 11600 | | 23200 | | | 18096 | | | 11600 | | N/A | | 23600 | |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | | Bits | | N/A | | N/A | | | N/A | | | N/A | | N/A | | N/A | |
| For Sub-Frame 5 | | Bits | | N/A | | N/A | | | N/A | | | N/A | | N/A | | N/A | |
| For Sub-Frame 0 | | Bits | | 9840 | | 19680 | | | 18720 | | | N/A | | 29520 | | 19680 | |
| Max. Throughput averaged over 1 frame | | Mbps | | 3.1976 | | 10.1112 | | | 7.884 | | | 4.96 | | 12.4704 | | 10.1112 | |
| UE Category | |  | | ≥ 1 | | ≥ 2 | | | ≥ 1 | | | ≥ 1 | | ≥ 2 | | ≥ 2 | |
| Note 1: 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  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: For R.44, R.45 and R.60, 50 resource blocks are allocated in sub-frames 1,2,3,4,6,7,8,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.45-1, 39 resource blocks are allocated in all subframes (RB0–RB20 and RB30–RB47). For R.50A-1, 50 resource blocks are allocated in sub-frames 2, 3, 4, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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) | | | | | | | | | | | | | | | | |

The reference measurement channels in Table A.3.3.3.2-3 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-3: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.64 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) |  | 6 |
| Allocated subframes per 4 Radio Frames |  | 15 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Information Bit Payload |  |  |
| For Sub-Frames 0,1,4,5,6,9 (Note 3) | Bits | 504 |
| For Sub-Frames 2,3,7,8 (Note 3) | Bits | 504 |
| Number of Code Blocks |  |  |
| For Sub-Frames 0,1,4,5,6,9 | Code blocks | 1 |
| For Sub-Frames 2,3,7,8 | Code blocks | 1 |
| Binary Channel Bits |  |  |
| For Sub-Frames 0,1,4,5,6,9 | Bits | 1440 |
| For Sub-Frames 2,3,7,8 | Bits | 1392 |
| Max. Throughput averaged over 4 frames | Mbps | 0.189 |
| UE DL Category |  | 0 |
| 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, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is avaialbe if downlink subframe is scheduled.  Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | |

The reference measurement channels in Table A.3.3.3.2-4 apply with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-4: Fixed Reference Channel for four antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.69 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Allocated subframes per Radio Frame |  | 8 |
| Modulation |  | QPSK |
| Target Coding Rate |  |  |
| For Sub-Frames 2,3,4,6,7,8,9 |  | 0.74 |
| For Sub-Frame 1 |  | 0.8 |
| Information Bit Payload |  |  |
| For Sub-Frames 2,3,4,6,7,8,9 | Bits | 7992 |
| For Sub-Frame 1 | Bits | 7992 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |
| For Sub-Frames 2,3,4,6,7,8,9 |  | 2 |
| For Sub-Frame 1 |  | 2 |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 |  | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 2,3,4,6,7,8,9 | Bits | 10800 |
| For Sub-Frame 1 | Bits | 10000 |
| 2 For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 6.3936 |
| UE Category |  | ≥ 1 |
| Note 1: 3 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: 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) | | |

The reference measurement channels in Table A.3.3.3.2-5 apply with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-5: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value |  | |
| Reference channel |  | R.98 FDD | | R.99 FDD |
| Channel bandwidth | MHz | 10 | | 10 |
| Allocated resource blocks |  | 50 (Note 3) | | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 | | 9 |
| Modulation |  | 16QAM | | 16QAM |
| Target Coding Rate |  | 1/2 | | 1/2 |
| Information Bit Payload |  |  | |  |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 22920 | | 11448 |
| For Sub-Frames 2,7 | Bits | 22920 | | 11448 |
| For Sub-Frame 5 | Bits | n/a | | n/a |
| For Sub-Frame 0 | Bits | 19080 | | 9528 |
| Number of Code Blocks (Note 4) |  |  | |  |
| For Sub-Frames 1,3,4,6,8,9 | Code blocks | 4 | | 2 |
| For Sub-Frames 2, 7 | Code blocks | 4 | | 2 |
| For Sub-Frame 5 | Bits | n/a | | n/a |
| For Sub-Frame 0 | Bits | 4 | | 2 |
| Binary Channel Bits |  |  | |  |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 43200 | | 21600 |
| For Sub-Frames 2,7 |  | 38400 | | 19200 |
| For Sub-Frame 5 | Bits | n/a | | n/a |
| For Sub-Frame 0 | Bits | 35424 | | 17712 |
| Max. Throughput averaged over 1 frame | Mbps | 20.244 | | 10.1112 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | | | |

The reference measurement channels in Table A.3.3.3.2-6 apply with four CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-6: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.100 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 22920 |
| For Sub-Frames 2,7 | Bits | 22920 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 19080 |
| Number of Code Blocks (Note 4) |  |  |
| For Sub-Frames 1,3,4,6,8,9 | Code blocks | 4 |
| For Sub-Frames 2, 7 | Code blocks | 4 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 4 |
| Binary Channel Bits |  |  |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 41600 |
| For Sub-Frames 2,7 |  | 36800 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 34112 |
| Max. Throughput averaged over 1 frame | Mbps | 20.244 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | |

#### A.3.3.3.2A Eight antenna ports (CSI-RS)

The reference measurement channels in Table A.3.3.3.2A-1 apply for verifying FDD CRI accuracy measurement with two CRS antenna ports and eight CSI-RS antenna ports.

Table A.3.3.3.2A-1: Fixed Reference Channel for eight antenna ports (CSI-RS)

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| Reference channel |  | R.50A-2 FDD | R.50A-3 FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks |  | 503 | 503 |
| Allocated subframes per Radio Frame |  | 7 | 5 |
| Modulation |  | 64QAM | 64QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 18336 | 18336 |
| For Sub-Frames (CSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A |
|  |  |  |  |
| For Sub-Frame 0 | Bits | 14688 | 14688 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 3 | 3 |
| For Sub-Frames (CSI-RS subframe) |  | N/A | N/A |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A |
| For Sub-Frame 0 |  | 3 | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 36000 | 36000 |
| For Sub-Frames (CSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | 29520 | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 12.4704 | 8.8032 |
| UE Category |  | ≥ 2 | ≥ 2 |
| Note 1: 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  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: For R.50A-2, 50 resource blocks are allocated in sub-frames 2, 3, 4, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.50A-3, 50 resource blocks are allocated in sub-frames 3, 4, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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) | | | |

Table A.3.3.3.2A-2: Fixed Reference Channel for eight antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.108 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 43 |
| Allocated subframes per Radio Frame |  | 8 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 472 |
| For Sub-Frames (CSI-RS subframe) | Bits | 472 |
| For Sub-Frame 5,7 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 1 |
| For Sub-Frames (CSI-RS subframe) |  | 1 |
| For Sub-Frame 5,7 |  | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 960 |
| For Sub-Frames (CSI-RS subframe) | Bits | 896 |
| For Sub-Frame 5,7 | Bits | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 0.3776 |
| UE Category |  | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: Allocated PRB positions for PDSCH are {2, 3, 4, 5} within the assigned narrowband. Allocated PRB positions for MPDCCH are {0, 1} within the assigned narrowband.  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) | | |

#### A.3.3.3.3 Twelve antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.3-1 apply for verifying PMI accuracy performance for UE-specific reference symbols with two cell-specific antenna ports and twelve CSI-RS antenna ports.

Table A.3.3.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with twelve CSI-RS antenna ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.77 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 18336 |
| For Sub-Frames (CSI-RS subframe) | Bits | 16416 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 |  | 14688 |
| Number of Code Blocks per Sub-Frame | Code blocks |  |
| For Sub-Frames (Non CSI-RS subframe) | Code blocks | 3 |
| For Sub-Frames (CSI-RS subframe) | Bits | 3 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 | Bits | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 36000 |
| For Sub-Frames (CSI-RS subframe) | Bits | 32400 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 15.7536 |
| UE Category |  | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | |

#### A.3.3.3.4 Sixteen antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.4-1 apply for verifying PMI accuracy performance for UE-specific reference symbols with two cell-specific antenna ports and sixteen CSI-RS antenna ports.

Table A.3.3.3.4-1: Fixed Reference Channel for CDM-multiplexed DM RS with sixteen CSI-RS antenna ports

|  |  |  |
| --- | --- | --- |
| Paramter | Unit | Value |
| Reference channel |  | R.78 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 11448 |
| For Sub-Frames (CSI-RS subframe) | Bits | 9912 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 |  | 9528 |
| Number of Code Blocks per Sub-Frame | Code blocks |  |
| For Sub-Frames (Non CSI-RS subframe) | Code blocks | 2 |
| For Sub-Frames (CSI-RS subframe) | Bits | 2 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 | Bits | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 24000 |
| For Sub-Frames (CSI-RS subframe) | Bits | 20800 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 9.804 |
| UE Category |  | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | |

#### A.3.3.3.5 Twenty-four antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.5-1 apply for verifying PMI accuracy performance for UE-specific reference symbols with two cell-specific antenna ports and twenty-four CSI-RS antenna ports.

Table A.3.3.3.5-1: Fixed Reference Channel for CDM-multiplexed DM RS with twenty-four CSI-RS antenna ports

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.88 FDD | R.88A FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 3) | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 | 9 |
| Modulation |  | 16QAM | 16QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 11448 | 11448 |
| For Sub-Frames (CSI-RS subframe) | Bits | 9912 | 11448 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 |  | 9528 | 9528 |
| Number of Code Blocks per Sub-Frame | Code blocks |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Code blocks | 2 | 2 |
| For Sub-Frames (CSI-RS subframe) | Bits | 2 | 2 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A |
| For Sub-Frame 0 | Bits | 2 | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 24000 | 24000 |
| For Sub-Frames (CSI-RS subframe) | Bits | 19200 | 22400 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 9.804 | 10.1112 |
| UE Category |  | ≥ 2 | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | | |

#### A.3.3.3.6 Thirty-two antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.6-1 apply for verifying PMI accuracy performance for UE-specific reference symbols with two cell-specific antenna ports and thirty-two CSI-RS antenna ports.

Table A.3.3.3.6-1: Fixed Reference Channel for CDM-multiplexed DM RS with thirty-two CSI-RS antenna ports

|  |  |  |
| --- | --- | --- |
| Paramter | Unit | Value |
| Reference channel |  | R.89 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 18336 |
| For Sub-Frames (CSI-RS subframe) | Bits | 15264 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 |  | 14688 |
| Number of Code Blocks per Sub-Frame | Code blocks |  |
| For Sub-Frames (Non CSI-RS subframe) | Code blocks | 3 |
| For Sub-Frames (CSI-RS subframe) | Bits | 3 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 | Bits | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 36000 |
| For Sub-Frames (CSI-RS subframe) | Bits | 26400 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 15.5232 |
| UE Category |  | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.  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). | | |

## A.3.4 Reference measurement channels for PDSCH performance requirements (TDD)

### A.3.4.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.4 TDD | R.42 TDD | R.2A TDD | R.2 TDD | R.42-1 TDD | R.42-2 TDD | R.42-3 TDD |
| Channel bandwidth | MHz | 1.4 | 20 | 10 | 10 | 3 | 5 | 15 |
| Allocated resource blocks (Note 6) |  | 6 | 100 | 50 | 50 | 15 | 25 | 75 |
| Uplink-Downlink Configuration (Note 4) |  | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3 | 3+2 | 5+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload (Note 6) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 408 | 8760 | 4392 | 4392 | 1320 | 2216 | 6712 |
| For Sub-Frames 1,6 | Bits | N/A | 7736 | 3240 | 3240 | 1128 | 1864 | 5992 |
| For Sub-Frames 3,8 | Bits | N/A | N/A | 4392 | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 208 | 8760 | 4392 | 4392 | 1064 | 1800 | 6712 |
| Number of Code Blocks (Notes 5 and 6) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 | 1 | 1 | 1 | 1 | 2 |
| For Sub-Frames 1,6 |  | N/A | 2 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 3,8 |  | N/A | N/A | 1 | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 2 | 1 | 1 | 1 | 1 | 2 |
| Binary Channel Bits (Note 6) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 1368 | 27600 | 13800 | 13800 | 3780 | 6300 | 20700 |
| For Sub-Frames 1,6 | Bits | N/A | 22656 | 11256 | 11256 | 3276 | 5556 | 16956 |
| For Sub-Frames 3,8 |  | N/A | N/A | 13800 | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 672 | 26904 | 13104 | 13104 | 3084 | 5604 | 20004 |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 0.102 | 4.175 | 2.844 | 1.966 | 0.596 | 0.996 | 3.212 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.  Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 4: As per Table 4.2-2 in TS 36.211 [4].  Note 5: 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 6: Given per component carrier per codeword. | | | | | | | | |

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  |  | R.3-1 TDD | R.3 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Uplink-Downlink Configuration (Note 3) |  |  |  | 1 | 1 |  |  |
| Allocated subframes per Radio Frame (D+S) |  |  |  | 3+2 | 3+2 |  |  |
| Modulation |  |  |  | 16QAM | 16QAM |  |  |
| Target Coding Rate |  |  |  | 1/2 | 1/2 |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  |  | 6456 | 14112 |  |  |
| For Sub-Frames 1,6 | Bits |  |  | 5160 | 11448 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 5736 | 12960 |  |  |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  |  |  | 2 | 3 |  |  |
| For Sub-Frames 1,6 |  |  |  | 1 | 2 |  |  |
| For Sub-Frame 5 |  |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 |  |  |  | 1 | 3 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  |  | 12600 | 27600 |  |  |
| For Sub-Frames 1,6 | Bits |  |  | 11112 | 22512 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 11208 | 26208 |  |  |
| Max. Throughput averaged over 1 frame | Mbps |  |  | 2.897 | 6.408 |  |  |
| UE Category |  |  |  | ≥ 1 | ≥ 2 |  |  |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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). | | | | | | | |

Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  | R.5 TDD | R.6 TDD | R.7 TDD | R.8 TDD | R.9 TDD |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 3) |  |  | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frames 1,6 | Bits |  | 6968 | 11448 | 23688 | 35160 | 46888 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 6968 | 12576 | 30576 | 45352 | 61664 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  |  | 2 | 3 | 5 | 8 | 11 |
| For Sub-Frames 1,6 |  |  | 2 | 2 | 4 | 6 | 8 |
| For Sub-Frame 5 |  |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  |  | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frames 1,6 | Bits |  | 9828 | 16668 | 33768 | 50868 | 67968 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 9252 | 16812 | 39312 | 60012 | 80712 |
| Max. Throughput averaged over 1 frame | Mbps |  | 3.791 | 6.370 | 13.910 | 20.945 | 27.877 |
| UE Category |  |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: As per Table 4.2-2 TS 36.211 [4].  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). | | | | | | | |

Table A.3.4.1-3a: Fixed Reference Channel 64QAM R=3/4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  | R.6-1 TDD | R.7-1 TDD | R.8-1 TDD | R.9-1 TDD | R.9-2 TDD |
| Channel bandwidth | MHz |  | 5 | 10 | 15 | 20 | 20 |
| Allocated resource blocks (Note 3) |  |  | 18 | 17 | 17 | 17 | 83 |
| Uplink-Downlink Configuration (Note 4) |  |  | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  | 10296 | 10296 | 10296 | 10296 | 51024 |
| For Sub-Frames 1,6 | Bits |  | 8248 | 7480 | 7480 | 7480 | 39232 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 8248 | 10296 | 10296 | 10296 | 51024 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  |  | 2 | 2 | 2 | 2 | 9 |
| For Sub-Frames 1,6 |  |  | 2 | 2 | 2 | 2 | 7 |
| For Sub-Frame 5 |  |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  |  | 2 | 2 | 2 | 2 | 9 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  | 13608 | 14076 | 14076 | 14076 | 68724 |
| For Sub-Frames 1,6 | Bits |  | 11880 | 11628 | 11628 | 11628 | 56340 |
| For Sub-Frame 5 | Bits |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits |  | 11520 | 14076 | 14076 | 14076 | 66636 |
| Max. Throughput averaged over 1 frame | Mbps |  | 4.534 | 4.585 | 4.585 | 4.585 | 23.154 |
| UE Category |  |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: Localized allocation started from RB #0 is applied.  Note 4: As per Table 4.2-2 TS 36.211 [4].  Note 5: 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). | | | | | | | |

Table A.3.4.1-4: Fixed Reference Channel Single PRB

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  | R.0 TDD |  | R.1 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10/20 | 15 | 20 |
| Allocated resource blocks |  |  | 1 |  | 1 |  |  |
| Uplink-Downlink Configuration (Note 3) |  |  | 1 |  | 1 |  |  |
| Allocated subframes per Radio Frame (D+S) |  |  | 3+2 |  | 3+2 |  |  |
| Modulation |  |  | 16QAM |  | 16QAM |  |  |
| Target Coding Rate |  |  | 1/2 |  | 1/2 |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  | 224 |  | 256 |  |  |
| For Sub-Frames 1,6 | Bits |  | 208 |  | 208 |  |  |
| For Sub-Frame 5 | Bits |  | N/A |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  | 224 |  | 256 |  |  |
| Number of Code Blocks per Sub-Frame  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  |  | 1 |  | 1 |  |  |
| For Sub-Frames 1,6 |  |  | 1 |  | 1 |  |  |
| For Sub-Frame 5 |  |  | N/A |  | N/A |  |  |
| For Sub-Frame 0 |  |  | 1 |  | 1 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  | 504 |  | 552 |  |  |
| For Sub-Frames 1,6 | Bits |  | 456 |  | 456 |  |  |
| For Sub-Frame 5 | Bits |  | N/A |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  | 504 |  | 552 |  |  |
| Max. Throughput averaged over 1 frame | Mbps |  | 0.109 |  | 0.118 |  |  |
| UE Category |  |  | ≥ 1 |  | ≥ 1 |  |  |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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). | | | | | | | |

Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.29 TDD (MBSFN) |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 1 |
| MBSFN Configuration (Note 5) |  | 010010 |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 1+2 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 | Bits | 0 (MBSFN) |
| For Sub-Frames 1,6 | Bits | 208 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 256 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |
| For Sub-Frames 4,9 | Bits | 0 (MBSFN) |
| For Sub-Frames 1,6 | Bits | 1 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4,9 | Bits | 0 (MBSFN) |
| For Sub-Frames 1,6 | Bits | 456 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 552 |
| Max. Throughput averaged over 1 frame | kbps | 67.2 |
| UE Category |  | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  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: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation | | |

Table A.3.4.1-6: Fixed Reference Channel QPSK R=1/10

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  |  |  |  | R.41 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 50 |  |  |
| Uplink-Downlink Configuration (Note 4) |  |  |  |  | 1 |  |  |
| Allocated subframes per Radio Frame (D+S) |  |  |  |  | 3+2 |  |  |
| Modulation |  |  |  |  | QPSK |  |  |
| Target Coding Rate |  |  |  |  | 1/10 |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  |  |  | 1384 |  |  |
| For Sub-Frames 1,6 | Bits |  |  |  | 1032 |  |  |
| For Sub-Frame 5 | Bits |  |  |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  |  | 1384 |  |  |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  |  |  |  | 1 |  |  |
| For Sub-Frames 1,6 |  |  |  |  | 1 |  |  |
| For Sub-Frame 5 |  |  |  |  | N/A |  |  |
| For Sub-Frame 0 |  |  |  |  | 1 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits |  |  |  | 13800 |  |  |
| For Sub-Frames 1,6 | Bits |  |  |  | 11256 |  |  |
| For Sub-Frame 5 | Bits |  |  |  | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  |  | 13104 |  |  |
| Max. Throughput averaged over 1 frame | Mbps |  |  |  | 0.622 |  |  |
| UE Category |  |  |  |  | ≥ 1 |  |  |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.  Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 4: As per Table 4.2-2 in TS 36.211 [4].  Note 5: 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). | | | | | | | |

Table A.3.4.1-7: Fixed Reference Channel for CA demodulation with power imbalance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.49 TDD | R.49-1 TDD |
| Channel bandwidth | MHz | 20 | 15 |
| Allocated resource blocks |  | 100 | 75 |
| Uplink-Downlink Configuration (Note 1) |  | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 |
| Modulation |  | 64QAM | 64QAM |
| Number of OFDM symbols for PDCCH per component carrier |  |  |  |
| For Sub-Frames 0,4,5,9 | OFDM symbols | 3 | 3 |
| For Sub-Frames 1,6 | OFDM symbols | 2 | 2 |
| Target Coding Rate |  |  |  |
| For Sub-Frames 4,9 |  | 0.84 | 0.83 |
| For Sub-Frames 1,6 |  | 0.81 | 0.80 |
| For Sub-Frames 5 |  | N/A | N/A |
| For Sub-Frames 0 |  | 0.87 | 0.86 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 0, 4, 9 | Bits | 63776 | 46888 |
| For Sub-Frame 1,6 | Bits | 55056 | 40576 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| Number of Code Blocks per Sub-Frame (Note 2) |  |  |  |
| For Sub-Frames 0, 4, 9 | Code Blocks | 11 | 8 |
| For Sub-Frame 1,6 | Code Blocks | 9 | 7 |
| For Sub-Frame 5 | Code Blocks | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |
| For Sub-Frames 4,9 | Bits | 75600 | 56700 |
| For Sub-Frame 1,6 | Bits | 67968 | 50868 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | 73512 | 54612 |
| Max. Throughput averaged over 1 frame | Mbps | 30.144 | 22.182 |
| UE Category |  | ≥5 | ≥ 3 |
| Note 1: Reference signal, synchronization signals and PBC allocated as per TS 36.211 [4].  Note 2: 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). | | | |

### A.3.4.2 Multi-antenna transmission (Common Reference Signals)

#### A.3.4.2.1 Two antenna ports

Table A.3.4.2.1-1: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | | | | | | Value | | | | | |
| Reference channel |  | R.10 TDD | R.11 TDD | R.11-1 TDD | R.11-2 TDD | R.11-3 TDD Note 6 | R.11-4 TDD | R.30 TDD | R.30-1 TDD | R.30-2 TDD | R.35 TDD | R.35-1 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 10 | 10 | 20 | 20 | 20 | 10 | 20 |
| Allocated resource blocks (Note 5) |  | 50 | 50 | 50 | 25 | 40 | 50 | 100 | 100 | 100 | 50 | 100 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 2+2 | 3+2 | 3+2 | 2 | 3+2 | 2+2 | 2 | 2+2 | 2 |
| Modulation |  | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 16QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.39 |
| Information Bit Payload (Note 5) |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 4392 | 12960 | 12960 | 5736 | 10296 | 6968 | 25456 | 25456 | 25456 | 19848 | 30576 |
| For Sub-Frames 1,6 |  | 3240 | 9528 | 9528 | 5160 | 9144 | N/A | 22920 | 21384 | N/A | 15840 | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 4392 | 12960 | N/A | 4968 | 10296 | N/A | 25456 | N/A | N/A | N/A | N/A |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 3 | 3 | 1 | 2 | 2 | 5 | 5 | 5 | 4 | 5 |
| For Sub-Frames 1,6 |  | 1 | 2 | 2 | 1 | 2 | N/A | 4 | 4 | N/A | 3 | N/A |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 3 | N/A | 1 | 2 | N/A | 5 | N/A | N/A | N/A | N/A |
| Binary Channel Bits (Note 5) |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 13200 | 26400 | 26400 | 12000 | 21120 | 13200 | 52800 | 52800 | 52800 | 39600 | 79200 |
| For Sub-Frames 1,6 |  | 10656 | 21312 | 21312 | 10512 | 16992 | 10656 | 42912 | 42912 | N/A | 31968 | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 12528 | 25056 | N/A | 10656 | 19776 | 12528 | 51456 | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 1.966 | 5.794 | 4.498 | 2.676 | 4.918 | 1.39 | 12.221 | 9.368 | 5.091 | 7.138 | 6.115 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | 3 | ≥ 2 | 4 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword.  Note 6: For R.11-3 resource blocks of RB6–RB45 are allocated. | | | | | | | | | | | | |

Table A.3.4.2.1-2: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | |
| Reference channel |  | R.46 TDD | R.47 TDD | R.35-2 TDD | R.11-5 TDD | R.11-6 TDD | R.11-7 TDD | R.11-8 TDD | R.11-9 TDD | R.11-10 TDD | R.11-11 TDD | R.11-12 TDD | R.10-3 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 1.4 | 3 | 5 | 10 | 15 | 10 | 10 | 10 | 10 |
| Allocated resource blocks (Note 5) |  | 50 | 50 | 50 | 6 | 15 | 25 | 50 | 75 | 50 | 50 | 50 | 50 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated number of PDCCH symbols in normal subframes |  | 2 | 2 | 2 | 4 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| Allocated number of PDCCH symbols in special subframes |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 3+2 | 2+2 | 2+2 | 3+2 |
| Modulation |  | QPSK | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | QPSK | QPSK | QPSK | 16QAM |
| Target Coding Rate |  |  |  | 0.47 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 3/5 |  |  |  |
| For Sub-Frames 4,9 |  |  |  |  |  |  |  |  |  |  | 0.58 | 0.66 | 0.58 |
| For Sub-Frames 1,6 |  |  |  |  |  |  |  |  |  |  | 0.48 | 0.54 | 0.57 |
| Information Bit Payload (Note 5) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 5160 | 8760 | 18336 | 1352 | 3368 | 5736 | 12960 | 19080 | 7992 | 6968 | 7992 | 15264 |
| For Sub-Frames 1,6 |  | 3880 | 7480 | 14688 | 1128 | 3112 | 5160 | 10680 | 15840 | 5736 | 5160 | 5736 | 12216 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 5160 | 8760 | N/A | N/A | N/A | N/A | N/A | N/A | 7992 | N/A | N/A | 14112 |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 | 3 | 1 | 1 | 1 | 3 | 4 | 2 | 2 | 2 | 3 |
| For Sub-Frames 1,6 |  | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 2 | N/A | N/A | N/A | N/A | N/A | N/A | 2 | N/A | N/A | 3 |
| Binary Channel Bits (Note 5) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 13200 | 26400 | 39600 | 2592 | 7200 | 12000 | 26400 | 39600 | 13200 | 12000 | 12000 | 26400 |
| For Sub-Frames 1,6 |  | 10656 | 21312 | 31968 | 2304 | 6192 | 10512 | 21312 | 32112 | 10656 | 10656 | 10656 | 21312 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 12528 | 25056 | N/A | N/A | N/A | N/A | N/A | N/A | 12528 | N/A | N/A | 25056 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 2.324 | 4.124 | 6.604 | 0.496 | 1.296 | 2.179 | 4.498 | 6.984 | 3.5448 | 2.4256 | 2.7456 | 6.9072 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: Void  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword | | | | | | | | | | | | | |

Table A.3.4.2.1-3: Fixed Reference Channel two antenna ports

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.62 TDD | R.63 TDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 3 | 1 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | 4+2 |
| Modulation |  | 16QAM | 64QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 744 | 408 |
| For Sub-Frames 1,6 | Bits | 440 | 280 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 |
| For Sub-Frames 1,6 | Clode blocls | 1 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 1584 | 792 |
| For Sub-Frames 1,6 |  | 1296 | 648 |
| Max. Throughput averaged over 1 frame | Mbps | 0.3856 | 0.2192 |
| UE DL Category |  | 0 | 0 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | | |

Table A.3.4.2.1-4: Fixed Reference Channel two antenna ports

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.65 TDD | R.84 TDD |
| Channel bandwidth | MHz | 20 | 10 |
| Allocated resource blocks (Note 5) |  | 100 | 39 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 2+2 | 3+2 |
| Modulation |  | 256QAM | 16QAM |
| Target Coding Rate |  |  | 1/2 |
| Information Bit Payload (Note 5) |  |  |  |
| For Sub-Frames 4,9 | Bits | 63776 | 9912 |
| For Sub-Frames 1,6 |  | 46888 | 7480 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9912 |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |
| For Sub-Frames 4,9 |  | 11 | 2 |
| For Sub-Frames 1,6 |  | 9 | 2 |
| For Sub-Frame 5 |  | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 |
| Binary Channel Bits (Note 5) |  |  |  |
| For Sub-Frames 4,9 | Bits | 115200 | 20592 |
| For Sub-Frames 1,6 |  | 95424 | 16848 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 20592 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 22.133 | 4.4696 |
| UE Category |  | 11-12 | 1bis |
| UE DL Category |  | ≥ 11 | N/A |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. For 256QAM reference channel 1 symbol is allocated.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword | | | |

Table A.3.4.2.1-5: Fixed Reference Channel two antenna ports when   
*EIMTA-MainConfigServCell-r12* is configured

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.67 TDD | | | | | | |
| Channel bandwidth | MHz | 10 | | | | | | |
| Allocated resource blocks (Note 5) |  | 50 | | | | | | |
| Modulation |  | 16QAM | | | | | | |
| Target Coding Rate |  | 0.4 | | | | | | |
| Dynamic Uplink-Downlink Configuration (Note 3) |  | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Allocated subframes per Radio Frame (D+S) |  | 1+2 | 3+2 | 5+2 | 5+1 | 6+1 | 7+1 | 2+2 |
| Information Bit Payload (Note 5) |  |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 9912 | 9912 | 9912 | 9912 | 9912 | 9912 | 9912 |
| For Sub-Frame 1 | Bits | 7480 | 7480 | 7480 | 7480 | 7480 | 7480 | 7480 |
| For Sub-Frame 2 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 3 | Bits | NA | NA | 9912 | NA | NA | 9912 | NA |
| For Sub-Frame 4 | Bits | NA | 9912 | 9912 | NA | 9912 | 9912 | NA |
| For Sub-Frame 5 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 6 | Bits | 7480 | 7480 | 7480 | 9912 | 9912 | 9912 | 7480 |
| For Sub-Frame 7 | Bits | NA | NA | NA | 9912 | 9912 | 9912 | NA |
| For Sub-Frame 8 | Bits | NA | NA | 9912 | 9912 | 9912 | 9912 | NA |
| For Sub-Frame 9 | Bits | NA | 9912 | 9912 | 9912 | 9912 | 9912 | 9912 |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 1 |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 2 |  | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 3 |  | NA | NA | 2 | NA | NA | 2 | NA |
| For Sub-Frame 4 |  | NA | 2 | 2 | NA | 2 | 2 | NA |
| For Sub-Frame 5 |  | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 6 |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 7 |  | NA | NA | NA | 2 | 2 | 2 | NA |
| For Sub-Frame 8 |  | NA | NA | 2 | 2 | 2 | 2 | NA |
| For Sub-Frame 9 |  | NA | 2 | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits (Note 5) |  |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 25056 | 25056 | 25056 | 25056 | 25056 | 25056 | 25056 |
| For Sub-Frame 1 | Bits | 21312 | 21312 | 21312 | 21312 | 21312 | 21312 | 21312 |
| For Sub-Frame 2 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 3 | Bits | NA | NA | 26400 | NA | NA | 26400 | NA |
| For Sub-Frame 4 | Bits | NA | 26400 | 26400 | NA | 26400 | 26400 | NA |
| For Sub-Frame 5 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 6 | Bits | 21312 | 21312 | 21312 | 26112 | 26112 | 26112 | 21312 |
| For Sub-Frame 7 | Bits | NA | NA | NA | 26400 | 26400 | 26400 | NA |
| For Sub-Frame 8 | Bits | NA | NA | 26400 | 26400 | 26400 | 26400 | NA |
| For Sub-Frame 9 | Bits | NA | 26400 | 26400 | 26400 | 26400 | 26400 | 26400 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 2.49 | 4.47 | 6.45 | 5.70 | 6.70 | 7.69 | 3.48 |
| Max. Throughput averaged over 1 frame and over all dynamic UL-DL configurations (Note 5) | Mbps | 5.28 | | | | | | |
| UE Category |  | ≥ 1 | | | | | | |
| Note 1: 2 OFDM symbols are allocated to PDCCH in all subframes  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword. | | | | | | | | |

Table A.3.4.2.1-6: Fixed Reference Channel two antenna ports

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Values | | |
| Reference channel |  | R.79 TDD | R.103 TDD | R.104 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 3 | 3 | 3 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | (Note 5) | 4 |
| Modulation |  | 16QAM | QPSK | 64QAM |
| Target Coding Rate |  | 1/2 | 1/3 | 0.4 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 744 | 224 | 968 |
| For Sub-Frames 1,6 | Bits | 440 | N/A | N/A |
| Number of Code Blocks |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 | 1 |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 | 1 |
| Binary Channel Bits |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 1584 | 792 | 2376 |
| For Sub-Frames 1,6 | Bits | 1296 | N/A | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 0.3856 | 0.0112 | 0.3872 |
| 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: As per Table 4.2-2 in TS 36.211 [4].  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: MPDCCH are scheduled at the 0th to 3rd BL/CE DL subframes with repetition every period=20ms. The associated PDSCH is scheduled at the 5th BL/CE DL subframe with repetition every period=20ms (starting from the 0th subframe). | | | | |

Table A.3.4.2.1-7: Fixed Reference Channel two antenna ports

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | R.81 TDD | R.81-1 TDD | R.81-2 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 6 | 6 | 6 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 |
| Allocated PDSCH subframes |  | Note 6 | Note 7 | Note 8 |
| Modulation |  | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/10 | 1/10 | 1/10 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 152 | 152 | 152 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A |
| Number of Code Blocks |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 | 1 |
| For Sub-Frames 1,6 | Clode blocls | N/A | N/A | N/A |
| Binary Channel Bits |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 1584 | 1584 | 1584 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A |
| Max. Throughput averaged over one period | kbps | 0.297 | 0.594 | 1.9 |
| UE DL Category |  | M1, ≥ 0 | ≥1 | ≥1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.  Note 5: The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. If it is not the BL/CE DL subframes, MPDCCH/PDSCH transmission is postponed until the next BL/CE DL subframe. Note the DL subframes in the TDD uplink-downlink configuration are considered as the BL/CE DL subframes.  Note 6: MPDCCH are scheduled at the 0th to 63rd BL/CE DL subframes with repetition every period=512ms. The associated PDSCH is scheduled at the 65th to 128th BL/CE DL subframes with repetition every 512ms (starting from the 0th subframe).  Note 7: MPDCCH are scheduled at the 0th to 31rd BL/CE DL subframes with repetition every period=256ms. The associated PDSCH is scheduled at the 33rd to 64 rd BL/CE DL subframes with repetition every 256ms (starting from the 0th subframe).  Note 8: MPDCCH are scheduled at the 0th to 7rd BL/CE DL subframes with repetition every period=80ms. The associated PDSCH is scheduled at the 9rd to 24 rd BL/CE DL subframes with repetition every 80ms (starting from the 0th subframe). | | | | |

Table A.3.4.2.1-8: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Values | | | | | | |
| Reference channel |  | R.87 TDD | R.87-1 TDD | R.aa TDD | R.bb TDD | R.87-2 TDD | R.87-3 TDD | R.87-4 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 5 | 15 | 20 |
| Allocated resource blocks (Note 4) |  | 50 | 50 | 50 | 50 | 25 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated number of PDCCH symbols |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Allocated subframes per Radio Frame (D+S) |  | 2+2 | 2+2 | 3+2 | 3+2 | 2+2 | 2+2 | 2+2 |
| Modulation |  | 64QAM | 16QAM | QPSK | 16QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 0.39 | 0.44 | 0.61 | 0.3 | 0.39 | 0.39 | 0.39 |
| For Sub-Frames 1,6 |  | 0.36 | 0.40 | 0.54 | 0.27 | 0.36 | 0.36 | 0.36 |
| For Sub-Frames 0 |  | N/A | N/A | 0.64 | 0.32 | N/A | N/A | N/A |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 15264 | 11448 | 7992 | 7992 | 7736 | 22920 | 30576 |
| For Sub-Frames 1,6 | Bits | 11448 | 8504 | 5736 | 5736 | 5544 | 16992 | 22920 |
| For Sub-Frames 0 | Bits | N/A | N/A | 7992 | 7992 | N/A | N/A | N/A |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Number of Code Blocks(Notes 3 and 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 3 | 4 | 2 | 2 | 2 | 4 | 5 |
| For Sub-Frames 1,6 |  | 2 | 4 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frames 0 |  | N/A | N/A | 2 | 2 | N/A | N/A | N/A |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 39600 | 26400 | 13200 | 26400 | 19800 | 59400 | 79200 |
| For Sub-Frames 1,6 |  | 31968 | 21312 | 10656 | 21312 | 15768 | 48168 | 64368 |
| For Sub-Frames 0 |  | N/A | N/A | 12528 | 25056 | N/A | N/A | N/A |
| For Sub-Frames 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 5.342 | 3.99 | 3.5448 | 3.5448 | 2.656 | 7.982 | 10.699 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 2: As per Table 4.2-2 in TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword. | | | | | | | | |

Table A.3.4.2.1-9: Fixed Reference Channel two antenna ports

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | R.47-1 TDD | R.47-2 TDD | R.47-3 TDD |
| Channel bandwidth | MHz | 5 | 15 | 20 |
| Allocated resource blocks |  | 25 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) |  | 1 | 1 | 1 |
| Allocated number of PDCCH symbols in normal subframes |  | 2 | 2 | 2 |
| Allocated number of PDCCH symbols in special subframes |  | 2 | 2 | 2 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 |
| Modulation |  | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  |  |  |  |
| For Sub-Frames 4,9 |  |  |  |  |
| For Sub-Frames 1,6 |  |  |  |  |
| Information Bit Payload (Note 4) |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 4008 | 12960 | 17568 |
| For Sub-Frames 1,6 |  | 3624 | 9912 | 15264 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 3496 | 12960 | 17568 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 3 | 3 |
| For Sub-Frames 1,6 |  | 1 | 2 | 3 |
| For Sub-Frame 5 |  | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 2 | 3 | 3 |
| Binary Channel Bits (Note 4) |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 12000 | 39680 | 52800 |
| For Sub-Frames 1,6 |  | 10512 | 32112 | 42912 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 10656 | 38256 | 51456 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 1.876 | 5.874 | 8.3232 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 2: As per Table 4.2-2 in TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword | | | | |

Table A.3.4.2.1-10: Fixed Reference Channel two antenna ports

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.90 TDD | R.91 TDD | R.92-1 TDD | R.92-2 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 18 (Note 9) | 18 (Note 9) | 36 (Note 10) | 36 (Note 10) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 |
| Allocated PDSCH subframes |  | (Note 4) | (Note 5) | (Note 6) | (Note 7) |
| Modulation |  | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/10 | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 1544 | 488 | 4392 | 4392 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A | N/A |
| Number of Code Blocks |  |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 | Clode blocls | N/A | N/A | N/A | N/A |
| Binary Channel Bits |  |  |  |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 4752 | 4752 | 9504 | 9504 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over one period | kbps | 19.3 | 1.90625 | 137.25 | 219.6 |
| UE DL Category |  | M2 | M2 | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: MPDCCH are scheduled at the 0th to 15th BL/CE DL subframes with repetition every period=80ms. The associated PDSCH is scheduled at the 17th to 24th BL/CE DL subframes with repetition every period=80ms (starting from the 0th subframe).  Note 5: MPDCCH are scheduled at the 0th to 31st BL/CE DL subframes with repetition every period= 256ms. The associated PDSCH is scheduled at the 33rd to 64th BL/CE DL subframes with repetition every period=256ms (starting from the 0th subframe).  Note 6: MPDCCH are scheduled at the 0th to 3rd BL/CE DL subframes with repetition every period=32ms. The associated PDSCH is scheduled at the 5th to 8th BL/CE DL subframes with repetition every period=32ms (starting from the 0th subframe).  Note 7: MPDCCH are scheduled at the 0th to 1st BL/CE DL subframes with repetition every period=20ms. The associated PDSCH is scheduled at the 2nd to 3rd BL/CE DL subframes with repetition every period=20ms (starting from the 0th subframe).  Note 8: If it is not the BL/CE DL subframes, MPDCCH/PDSCH transmission is postponed until the next BL/CE DL subframe. Note the DL subframes in the TDD uplink-downlink configuration are considered as the BL/CE DL subframes.  Note 9: Allocated PRB positions are {0, 1, …, 17} within the assigned wideband.  Note 10: Allocated PRB positions are {1, 2, 3, …, 18, 31, 32, …, 48}.  Note 11: Allocated PRB positions for MPDCCH are {0, 1, 2, 3, 4, 5} within the scheduled narrowband. | | | | | |

Table A.3.4.2.1-11: Fixed Reference Channel two antenna ports

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.11-13 TDD |  |
| Channel bandwidth | MHz | 10 |  |
| Allocated resource blocks (Note 5) |  | 50 |  |
| Uplink-Downlink Configuration (Note 3) |  | 4 |  |
| Special subframe configuration |  | 4 |  |
| Allocated subframes per Radio Frame (D+S) |  | 7+1 |  |
| Modulation |  | 16QAM |  |
| Target Coding Rate |  | 1/2 |  |
| Information Bit Payload (Note 5) |  |  |  |
| For Sub-Frames 0,4,6,7,8,9 | Bits | 10680 |  |
| For Sub-Frames 1 |  | 7736 |  |
| For Sub-Frames 5 |  | NA |  |
| Number of Code Blocks (Notes 4 and 5) |  |  |  |
| For Sub-Frames 0,4,5,6,7,8,9 |  | 2 |  |
| For Sub-Frames 1 |  | 2 |  |
| For Sub-Frames 5 |  | NA |  |
| Binary Channel Bits (Note 5) |  |  |  |
| For Sub-Frames 0,4,5,6,7,8,9 | Bits | 21648 |  |
| For Sub-Frames 1 |  | 17424 |  |
| For Sub-Frames 5 |  | NA |  |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 7.1816 |  |
| UE Category |  | ≥ 2 |  |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword.  Note 6: 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0,1,4,5,6,7,8,9. | | | |

#### A.3.4.2.2 Four antenna ports

Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | | |
| Reference channel |  | R.12 TDD | R.13 TDD | R.14 TDD | R.14-1 TDD | R.14-2 TDD | R.43 TDD | R.36 TDD | R.43-1 TDD | R.43-2 TDD | R.43-3 TDD | R.43-4 TDD | R.43-5 TDD | R.36-1 TDD |
| Channel bandwidth | MHz | 1.4 | 10 | 10 | 10 | 10 | 20 | 10 | 1.4 | 3 | 5 | 10 | 15 | 10 |
| Allocated resource blocks (Note 6) |  | 6 | 50 | 50 | 6 | 3 | 100 | 50 | 6 | 15 | 25 | 50 | 75 | 50 |
| Uplink-Downlink Configuration (Note 4) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3 | 3+2 | 2+2 | 2 | 2 | 2+2 | 2+2 | 2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 |
| Modulation |  | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | ½ | ½ | 0.55 |
| Information Bit Payload (Note 6) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 408 | 4392 | 12960 | 1544 | 744 | 25456 | 18336 | 1192 | 3368 | 5736 | 12960 | 19080 | 21384 |
| For Sub-Frames 1,6 | Bits | N/A | 3240 | 9528 | N/A | N/A | 21384 | 15840 | N/A | 2856 | 5160 | 10680 | 15840 | 16992 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 208 | 4392 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Number of Code Blocks  (Notes 5 and 6) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 1 | 3 | 1 | 1 | 5 | 3 | 1 | 1 | 1 | 3 | 4 | 4 |
| For Sub-Frames 1,6 |  | N/A | 1 | 2 | N/A | N/A | 4 | 3 | N/A | 1 | 1 | 2 | 3 | 3 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits (Note 6) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 1248 | 12800 | 25600 | 3072 | 1536 | 51200 | 38400 | 2496 | 6960 | 11600 | 25600 | 38400 | 38400 |
| For Sub-Frames 1,6 |  | N/A | 10256 | 20512 | N/A | N/A | 41312 | 30768 | N/A | 5952 | 10112 | 20512 | 30912 | 30768 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 624 | 12176 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 0.102 | 1.966 | 4.498 | 0.309 | 0.149 | 9.368 | 6.835 | 0.238 | 1.245 | 2.179 | 4.728 | 6.984 | 7.675 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.  Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 4: As per Table 4.2-2 in TS 36.211 [4].  Note 5: 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 6: Given per component carrier per codeword. | | | | | | | | | | | | | | |

Table A.3.4.2.2-2: Fixed Reference Channel four antenna ports

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | |
| Reference channel |  | R.72 TDD | R.72-1 TDD | R.72-2 TDD | R.72-3 TDD | R.73 TDD | R.73-1 TDD | R.74 TDD | R.85 TDD | R.93 TDD |
| Channel bandwidth | MHz | 10 | 5 | 15 | 20 | 10 | 10 | 10 | 10  (Note 7) | 10  (Note 7) |
| Allocated resource blocks (Note 6) |  | 50 | 25 | 75 | 100 | 50 | 50 | 50 | 24 | 24 |
| Uplink-Downlink Configuration (Note 4) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 3+2 | 3+2 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 64QAM | 16QAM | 16QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 0.60 | 0.62 | 0.59 | 0.60 | 0.44 | 1/2 | 1/2 | 1/2 | 0.5 |
| Information Bit Payload (Note 6) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 31704 | 15840 | 46888 | 63776 | 16416 (CW0)  32856 (CW1) | 12960 (CW0)  25456 (CW1) | 25456 | 10296 | 9528 |
| For Sub-Frames 1,6 | Bits | 23688 | 11448 | 35160 | 46888 | 12216 (CW0)  24496 (CW1) | 9528 (CW0)  19080 (CW1) | 19080 | 8248 | 7224 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 10296 | 9528 |
| Number of Code Blocks  (Notes 5 and 6) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 6 | 3 | 8 | 11 | 3 (CW0)  6 (CW1) | 3 (CW0)  5 (CW1) | 5 | 2 | 2 |
| For Sub-Frames 1,6 |  | 4 | 2 | 6 | 8 | 2 (CW0)  4 (CW1) | 2 (CW0)  4 (CW1) | 4 | 2 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 2 | 2 |
| Binary Channel Bits (Note 6) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 51200 | 23200 | 76800 | 102400 | 38400 (CW0)  76800 (CW1) | 25600 (CW0)  51200 (CW1) | 51200 | 18432 | 18432 |
| For Sub-Frames 1,6 |  | 41024 | 20224 | 61824 | 82624 | 30768 (CW0)  61536 (CW1) | 21312 (CW0)  42624 (CW1) | 41024 | 14976 | 14976 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 18432 | 18432 |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 11.0784 | 5.4576 | 16.4096 | 22.1328 | 5.726 (CW0)  11.470 (CW1) | 4.498 (CW0)  8.907 (CW1) | 8.907 | 4.7384 | 4.303 |
| UE Category |  | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 5 | ≥ 5 | ≥ 5 | 1bis | 1bis |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.  Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 4: As per Table 4.2-2 in TS 36.211 [4].  Note 5: 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 6: Given per component carrier per codeword.  Note 7: 24 resource blocks (RB 0-20 and 30-32) are allocated in sub-frames 0, 1, 2, 3, 4, 6, 7, 8, 9 | | | | | | | | | | |

Table A.3.4.2.2-3: Fixed Reference Channel four antenna ports

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.74-1 TDD | R.74-2 TDD | R.74-3 TDD | R.101 TDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 10 |
| Allocated resource blocks (Note 6) |  | 25 | 75 | 100 | 50 |
| Uplink-Downlink Configuration (Note 4) |  | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 2+2 | 2+2 | 2+2 | 3+2 |
| Modulation |  | 16QAM | 16QAM | 16QAM | 1024QAM |
| Target Coding Rate |  | 1/2 | 1/2 | 1/2 |  |
| Information Bit Payload (Note 6) |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 11448 | 37888 | 51024 | 52752 |
| For Sub-Frames 1,6 | Bits | 10296 | 31704 | 42368 | 39232 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | 52752 |
| Number of Code Blocks |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 2 | 7 | 9 | 9 |
| For Sub-Frames 1,6 |  | 2 | 5 | 7 | 9 |
| For Sub-Frame 0,5 |  | N/A | N/A | N/A | N/A |
| Binary Channel Bits |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 23200 | 76800 | 102400 | 68000 |
| For Sub-Frames 1,6 | Bits | 20224 | 61824 | 82624 | 55280 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | 65600 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 4.3488 | 13.9184 | 18.6784 | 23.6720 |
| UE Category |  | ≥ 5 | ≥ 5 | ≥ 5 | TBD |
| UE DL Category |  | - | - | - | 20, ≥ 22 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. 1 symbol allocated to PDCCH for reference channel with 1024QAM.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword. | | | | | |

Table A.3.4.2.2-4: Fixed Reference Channel four antenna ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Values |
| Reference channel |  | R.95 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) |  | 3 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 744 |
| For Sub-Frames 1,6 | Bits | 440 |
| Number of Code Blocks |  |  |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 |
| Binary Channel Bits |  |  |
| For Sub-Frames 0,4,5,9 | Bits | 1536 |
| For Sub-Frames 1,6 | Bits | 1248 |
| Max. Throughput averaged over 1 frames | Mbps | 0.3856 |
| UE DL Category |  | 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: As per Table 4.2-2 in TS 36.211 [4].  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. | | |

### A.3.4.3 Reference Measurement Channels for UE-Specific Reference Symbols

#### A.3.4.3.1 Single antenna port (Cell Specific)

The reference measurement channels in Table A.3.4.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with one cell-specific antenna port.

Table A.3.4.3.1-1: Fixed Reference Channel for DRS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | | |
| Reference channel |  | R.25 TDD | R.26 TDD | R.26-1 TDD | R.27 TDD | R.27-1  TDD | R.28 TDD |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 4 | 50 4 | 25 4 | 50 4 | 18 6 | 1 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 16QAM |
| Target Coding Rate |  | 1/3 | 1/2 | 1/2 | 3/4 | 3/4 | 1/2 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 4392 | 12960 | 5736 | 28336 | 10296 | 224 |
| For Sub-Frames 1,6 | Bits | 3240 | 9528 | 4584 | 22920 | 8248 | 176 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 2984 | 9528 | 3880 | 22152 | 10296 | 224 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 3 | 1 | 5 | 2 | 1 |
| For Sub-Frames 1,6 |  | 1 | 2 | 1 | 4 | 2 | 1 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 2 | 1 | 4 | 2 | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 12600 | 25200 | 11400 | 37800 | 13608 | 504 |
| For Sub-Frames 1,6 | Bits | 10356 | 20712 | 10212 | 31068 | 11340 | 420 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 10332 | 20664 | 7752 | 30996 | 13608 | 504 |
| Max. Throughput averaged over 1 frame | Mbps | 1.825 | 5.450 | 2.452 | 12.466 | 4.738 | 0.102 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.25, R.26 and R.27, 50 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.26-1, 25 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0.  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | | | | | | |

The reference measurement channels in Table A.3.4.3.1-2 apply for verifying demodulation performance for UE-specific reference symbols with one cell-specific antenna port.

Table A.3.4.3.1-2: Fixed Reference Channel for DRS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | R.80 TDD | R.80-1 TDD | R.80-2 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) |  | 6 | 6 | 6 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 |
| Allocated PDSCH subframes |  | Note 6 | Note 7 | Note 8 |
| Modulation |  | QPSK | QPSK | QPSK |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 504 | 504 | 504 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A |
| For Sub-Frames 0,5 | Bits | 504 | 504 | 504 |
| Number of Code Blocks per Sub-Frame |  |  |  |  |
| For Sub-Frames 4,9 | Code blocks | 1 | 1 | 1 |
| For Sub-Frames 1,6 | Code blocks | N/A | N/A | N/A |
| For Sub-Frames 0,5 | Code blocks | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 1440 | 1440 | 1440 |
| For Sub-Frames 1,6 |  | N/A | N/A | N/A |
| For Sub-Frames 0,5 | Bits | 1440 | 1440 | 1440 |
| Max. Throughput averaged over one period | kbps | 6.3 | 12.6 | 25.2 |
| UE DL Category |  | M1, ≥ 0 | ≥1 | ≥1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.  Note 5: The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. If it is not BL/CE DL subframes, MPDCCH/PDSCH transmission is postponed until the next BL/CE DL subframe. Note the DL subframes in the TDD uplink-downlink configuration are considered as the BL/CE DL subframes.  Note 6: MPDCCH are scheduled at the 0th to 7th BL/CE DL subframes with repetition every period=80ms. The associated PDSCH is scheduled at the 9th to 16th BL/CE DL subframes every 80ms (starting from the 0th subframe).  Note 7: MPDCCH are scheduled at the 0th to 1th BL/CE DL subframes with repetition every period=40ms. The associated PDSCH is scheduled at the 3th to 6th BL/CE DL subframes every 40ms (starting from the 0th subframe).  Note 8: MPDCCH are scheduled at the 0th BL/CE DL subframes with repetition every period=20ms. The associated PDSCH is scheduled at the 1th to 2th BL/CE DL subframes every 20ms (starting from the 0th subframe). | | | | |

#### A.3.4.3.2 Two antenna ports (Cell Specific)

The reference measurement channels in Table A.3.4.3.2-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports.

Table A.3.4.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.31 TDD | R.32 TDD | R.32-1 TDD | R.33 TDD | R.33-1  TDD | R.34  TDD | R.86  TDD |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 4 | 50 4 | 25 4 | 50 4 | 18 6 | 50 4 | 50 4 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 64QAM | QPSK |
| Target Coding Rate |  | 1/3 | 1/2 | 1/2 | 3/4 | 3/4 | 1/2 | 1/3 |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 3624 | 11448 | 5736 | 27376 | 9528 | 18336 | 4392 |
| For Sub-Frames 1,6 |  | 2664 | 7736 | 3112 | 16992 | 7480 | 11832 | 2664 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 2984 | 9528 | 3496 | 22152 | 9528 | 14688 | 3624 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 | 1 | 5 | 2 | 3 | 1 |
| For Sub-Frames 1,6 |  | 1 | 2 | 1 | 3 | 2 | 2 | 1 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 2 | 1 | 4 | 2 | 3 | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 12000 | 24000 | 10800 | 36000 | 12960 | 36000 | 11400 |
| For Sub-Frames 1,6 |  | 7872 | 15744 | 6528 | 23616 | 10368 | 23616 | 7872 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9840 | 19680 | 7344 | 29520 | 12960 | 29520 | 9840 |
| Max. Throughput averaged over 1 frame | Mbps | 1.556 | 4.79 | 2.119 | 11.089 | 4.354 | 7.502 | 1.7736 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | 1bis |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.31, R.32, R.33 , R.34 and R.86, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.32-1, 25 resouce blocks are allocated in sub-frames 4,9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | | | | | | | |

The reference measurement channels in Table A.3.4.3.2-2 apply with two CRS antenna ports.

Table A.3.4.3.2-2: Fixed Reference Channel for CDM-multiplexed DM RS

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.70 TDD | R.71 TDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 4) | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 2+2 | 2+2 |
| Modulation |  | QPSK | 16QAM |
| Target Coding Rate |  |  |  |
| For Sub-Frames 4,9 |  | 0.65 | 0.6 |
| For Sub-Frames 1,6 |  | 0.54 | 0.5 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 4,9 | Bits | 6968 | 12960 |
| For Sub-Frames 1,6 | Bits | 4264 | 7736 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |
| For Sub-Frames 4,9 |  | 2 | 3 |
| For Sub-Frames 1,6 |  | 1 | 2 |
| For Sub-Frame 5 |  | N/A | N/A |
| For Sub-Frame 0 |  | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |
| For Sub-Frames 4,9 | Bits | 10800 | 21600 |
| For Sub-Frames 1,6 | Bits | 7872 | 15744 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 2.2464 | 4.1392 |
| UE Category |  | ≥ 1 | ≥ 2 |
| Note 1: 3 symbols allocated to PDCCH in normal subframes and 2 symbols allocated to PDCCH in special subframes  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.63, and R.64, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in the DwPTS portion of sub-frames 1,6.  Note 5: 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). | | | |

#### A.3.4.3.3 Two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.3-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

Table A.3.4.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | |
| Reference channel |  | R.51 TDD | R.51-1 TDD | R.76 TDD | R.51-2 TDD | R.51-3 TDD | R.51-4 TDD | R.X TDD | R.94 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 15 | 20 | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) | 25 (Note 6) | 75 (Note 7) | 100 (Note 8) | 50 (Note 5) | 24 (Note 9) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 16QAM | 64QAM | QPSK |
| Target Coding Rate |  | 1/2 | 0.57 |  | 1/2 | 1/2 | 1/2 | 1/2 | 2/3 |
| Information Bit Payload |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 11448 | N/A | 6200 | NA | NA | NA | NA | N/A |
| For Sub-Frame 4,9 | Bits | 11448 | 12960 | 6200 | 4968 | 16992 | 22920 | 18336 | 3752 |
| For Sub-Frames 1,6 | Bits | 7736 | 9144 | 4264 | 3112 | 12216 | 16992 | 11832 | 2856 |
| For Sub-Frame 5 | Bits | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9528 | 10680 | 4968 | 3496 | 14112 | 19848 | 14688 | 3752 |
| Number of Code Blocks  (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Code blocks | 2 | N/A | 2 | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 | Code blocks | 2 | 3 | 2 | 1 | 3 | 4 | 3 | 1 |
| For Sub-Frames 1,6 | Code blocks | 2 | 2 | 1 | 1 | 3 | 3 | 3 | 1 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Code blocks | 2 | 2 | 1 | 1 | 3 | 4 | 3 | 1 |
| Binary Channel Bits |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Bits | 24000 | N/A | 11800 | NA | NA | NA | N/A | N/A |
| For Sub-Frames 4,9 |  | 22800 | 22800 | 11800 | 10200 | 34200 | 45600 | 34200 | 5472 |
| For Sub-Frames 1,6 |  | 15744 | 15744 | 7872 | 6144 | 24192 | 33792 | 23616 | 4608 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 19680 | 9840 | 6912 | 30240 | 42240 | 29520 | 5760 |
| Max. Throughput averaged over 1 frame | Mbps | 4.7896 | 5.4888 | 2.5896 | 1.9656 | 7.2528 | 99.672 | 7.502 | 1.697 |
| UE Category |  | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | 1bis |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  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: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 6: 25 resource blocks are allocated in sub-frames 4,9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 7: 75 resource blocks are allocated in sub-frames 4,9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 8: 100 resource blocks are allocated in sub-frames 4,9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 9: 24 resource blocks (RB 0-20 and 30-32) are allocated in sub-frames 0, 1, 2, 3, 4, 6, 7, 8, 9 | | | | | | | | | |

The reference measurement channels in Table A3.4.3.3-2 apply for verifying demudlation performance for UE-specific reference symbols with two cell specific antenna ports and two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS in same subframe.

Table A.3.4.3.3-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.52 TDD | R.52-1 TDD | R.53 TDD | R.54 TDD | R.76A TDD | R.97 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 64QAM | 16QAM | 64QAM | 16QAM | QPSK | 16QAM |
| Target Coding Rate |  | 1/2 | 0.57 | 1/2 | 1/2 | 1/3 | 1/2 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frame 4,9 | Bits | 16416 | 12960 | 16416 | 11448 | 3624 | 11448 |
| For Sub-Frames 1,6 | Bits | 11832 | 9144 | 11832 | 7736 | 2664 | 6712 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 14688 | 10680 | 14688 | 9528 | 2984 | 9528 |
| Number of Code Blocks  (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Code blocks | 3 | 3 | 3 | 2 | 1 | 2 |
| For Sub-Frames 1,6 | Code blocks | 2 | 2 | 2 | 2 | 1 | 2 |
| For Sub-Frame 5 |  | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Code blocks | 3 | 2 | 3 | 2 | 1 | 2 |
| Binary Channel Bits |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 34200 | 22800 | 33600 | 22800 | 11200 | 22400 |
| For Sub-Frames 1,6 |  | 23616 | 15744 | 23616 | 15744 | 7544 | 15744 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 29520 | 19680 | 29520 | 19680 | 9512 | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 7.1184 | 5.4888 | 7.1184 | 4.7896 | 1.5560 | 4.5848 |
| UE Category |  | ≥ 2 | ≥2 | ≥ 2 | ≥ 2 | 1 | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  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: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6. | | | | | | | |

Table A.3.4.3.3-3: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.76-1 TDD | R.76-2 TDD | R.76-3 TDD | R.76-4 TDD | R.76-5 TDD | R.76-6 TDD | R.76-7 TDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 25 (Note 6) | 75 (Note 7) | 100 (Note 8) | 25 (Note 6) | 50 (Note 5) | 75 (Note 7) | 100 (Note 8) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate |  |  |  |  |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 4,9 | Bits | 2600 | 9144 | 12216 | 3496 | 7992 | 11832 | 15840 |
| For Sub-Frames 1,6 | Bits | 1480 | 5736 | 7992 | 1864 | 4776 | 7480 | 10296 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 1736 | 7736 | 10680 | 2344 | 6456 | 9912 | 14112 |
| Number of Code Blocks  (Note 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Code blocks | NA | NA | NA | NA | 2 | NA | NA |
| For Sub-Frames 4,9 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| For Sub-Frames 1,6 | Code blocks | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| Binary Channel Bits |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 5100 | 17100 | 22800 | 5100 | 11800 | 17100 | 22800 |
| For Sub-Frames 1,6 | Bits | 3072 | 12096 | 16896 | 3072 | 7872 | 12096 | 16896 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 3456 | 15120 | 21120 | 3456 | 9840 | 15120 | 21120 |
| Max. Throughput averaged over 1 frame | Mbps | 0.9896 | 3.7496 | 5.1096 | 1.3064 | 3.1992 | 4.8536 | 6.6384 |
| UE Category |  | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  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: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 6: 25 resource blocks are allocated in sub-frames 4,9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 7: 75 resource blocks are allocated in sub-frames 4,9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 8: 100 resource blocks are allocated in sub-frames 4,9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 9: Given per component carrier per codeword. | | | | | | | | |

#### A.3.4.3.4 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.4-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | |
| Reference channel |  | R.44 TDD | R.48 TDD | R.66 TDD | R.75 TDD | R.75A  TDD | R.cc TDD | R.61A TDD | R.102 TDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 10 | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 4) | 50 (Note 4) | 100 | 50 (Note 4) | 50  (Note 4) | 50 (Note 4) | 50 (Note 4) | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 |  |  | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | 64QAM | QPSK | 256QAM | 16QAM | 16QAM | 16QAM | 16QAM | 1024QAM |
| Target Coding Rate |  | ½ |  |  | 0.57 | 0.51 |  | 1/2 | 3/4 |
| Information Bit Payload |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 18336 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 16416 | 6200 | 71112 | 25456 | 25456 | 15264 | 11448 | 52752 |
| For Sub-Frames 1,6 |  | 11832 | 4264 | 48936 | 16992 | 16992 | 9144 | 7736 | 31704 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 14688 | 4968 | 66592 | 21384 | 21384 | 12576 | 9528 | 43816 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) |  | 3 | 2 | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) |  | 3 | 2 | 12 | 5 | 5 | 3 | 2 | 9 |
| For Sub-Frames 1,6 |  | 2 | 1 | 8 | 3 | 3 | 2 | 2 | 6 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 3 | 1 | 11 | 4 | 4 | 3 | 2 | 7 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 36000 | 12000 | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 33600 | 11600 | 89600 | 40000 | 44800 | 22400 | 22400 | 64000 |
| For Sub-Frames 1,6 |  | 23616 | 7872 | 67584 | 27552 | 32352 | 15744 | 15744 | 44280 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 29520 | 9840 | 84480 | 35424 | 40224 | 19680 | 19680 | 54120 |
| Max. Throughput averaged over 1 frame | Mbps | 7.1184 | 2.5896 | 30.669 | 10.628 | 10.628 | 6.1392 | 6.1392 | 21.2728 |
| UE Category |  | ≥ 2 | ≥ 1 | 11-12 | ≥ 5 | ≥ 5 | ≥ 2 | ≥ 2 | TBD |
| UE DL Category |  | ≥ 6 | ≥ 6 | ≥ 11 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | 20, ≥ 22 |
| Note 1: 2 symbols allocated to PDCCH. 1 symbol allocated to PDCCH for reference channel with 1024QAM.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.44,R.48, R.75 and R.cc, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.66, 100 resource blocks are allocated in sub-frames 4, 9 and 88 resources blockes (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: 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). | | | | | | | | | |

The reference measurement channels in Table A.3.4.3.4-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-2: Fixed Reference Channel for four antenna ports (CSI-RS)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | R.60  TDD | R.61  TDD | R.61-1 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks |  | 504 | 504 | 395 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | 4+2 | 4+2 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 |
| Modulation |  | QPSK | 16QAM | 16QAM |
| Target Coding Rate |  | 1/2 | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A | N/A | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 6200 | 11448 | 8760 |
| For Sub-Frames 1,6 | Bits | N/A | 7736 | 7480 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9528 | 8760 |
| Number of Code Blocks per Sub-Frame (Note 6) |  |  |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) |  | N/A | N/A | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) |  | 2 | 2 | 2 |
| For Sub-Frames 1,6 |  | N/A | 2 | 2 |
| For Sub-Frame 5 |  | N/A | N/A | N/A |
| For Sub-Frame 0 |  | N/A | 2 | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A | N/A | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 11600 | 23200 | 18096 |
| For Sub-Frames 1,6 | Bits | N/A | 15744 | 14976 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 19680 | 18720 |
| Max. Throughput averaged over 1 frame | Mbps | 1.24 | 4.7896 | 4.1240 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 1 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: For R. 60 and R.61, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: For R. 61-1, 39 resource blocks (RB0–RB20 and RB30–RB47) are allocated in sub-frame 0, 1, 4, 6 and 9.  Note 6: 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 7: Localized allocation started from RB #0 is applied. | | | | |

The reference measurement channels in Table A.3.4.3.4-3 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-3: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.64 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) |  | 6 |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 504 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 504 |
| For Sub-Frames 1,6 |  | 256 |
| For Sub-Frames 0,5 | Bits | 504 |
| Number of Code Blocks per Sub-Frame |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Code blocks | 1 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Code blocks | 1 |
| For Sub-Frames 1,6 | Code blocks | 1 |
| For Sub-Frames 0,5 | Code blocks | 1 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 1440 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 1352 |
| For Sub-Frames 1,6 |  | 1152 |
| For Sub-Frames 0,5 | Bits | 1440 |
| Max. Throughput averaged over 1 frame | Mbps | 0.2528 |
| UE DL Category |  | 0 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | |

The reference measurement channels in Table A.3.4.3.4-4 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-4: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.69 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 2+2 |
| Modulation |  | QPSK |
| Target Coding Rate |  |  |
| For Sub-Frame 4(CSI-RS subframe) |  | 0.8 |
| For Sub-Frame 9 (non CSI-RS subframe) |  | 0.74 |
| For Sub-Frames 1,6 |  | 0.61 |
| Information Bit Payload |  |  |
| For Sub-Frame 4(CSI-RS subframe) | Bits | 7992 |
| For Sub-Frame 9 (non CSI-RS subframe) | Bits | 7992 |
| For Sub-Frames 1,6 | Bits | 4776 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frame 4(CSI-RS subframe) |  | 2 |
| For Sub-Frame 9 (non CSI-RS subframe) |  | 2 |
| For Sub-Frames 1,6 |  | 1 |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 |  | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frame 4(CSI-RS subframe) | Bits | 10000 |
| For Sub-Frame 9 (non CSI-RS subframe) | Bits | 10800 |
| For Sub-Frames 1,6 | Bits | 7872 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 2.5536 |
| UE Category |  | ≥ 1 |
| Note 1: 3 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in the DwPTS portion of sub-frames 1,6.  Note 5: 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). | | |

The reference measurement channels in Table A.3.4.3.4-5 apply for verifying CRI reporting accuracy with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.4-5: Fixed Reference Channel for four antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | R.44A-1 TDD |
| Channel bandwidth | MHz | 10 |
| Uplink-Downlink Configuration (Note 3) |  | 2 |
| Allocated resource blocks |  | 504 |
| Allocated subframes per Radio Frame |  | 4+2 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 18336 |
| For Sub-Frames (CSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frames 1,6 |  | 11832 |
| For Sub-Frame 0 | Bits | 14688 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 3 |
| For Sub-Frames (CSI-RS subframe) |  | N/A |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frames 1,6 |  | 2 |
| For Sub-Frame 0 |  | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 36000 |
| For Sub-Frames (CSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frames 1,6 | Bits | 23616 |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 9.336 |
| UE Category |  | ≥ 2 |
| Note 1: 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  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.44A-1, 50 resource blocks are allocated in sub-frames 3, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and and the DwPTS portion of sub-frames 1,6.  Note 5: 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) | | |

The reference measurement channels in Table A.3.4.3.4-6 apply with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-6: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.98 TDD | R.99 TDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 5) | 50 (Note 5) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 |
| Modulation |  | 16QAM | 16QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frame 4,9 | Bits | 22920 | 11448 |
| For Sub-Frames 1,6 | Bits | 14112 | 6712 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 19080 | 9528 |
| Number of Code Blocks  (Note 4) |  |  |  |
| For Sub-Frames 4,9 | Code blocks | 4 | 2 |
| For Sub-Frames 1,6 | Code blocks | 3 | 2 |
| For Sub-Frame 5 |  | n/a | n/a |
| For Sub-Frame 0 | Code blocks | 4 | 2 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 4,9 |  | 38400 | 19200 |
| For Sub-Frames 1,6 |  | 27552 | 13776 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 35424 | 17712 |
| Max. Throughput averaged over 1 frame | Mbps | 9.3144 | 4.5848 |
| UE Category |  | ≥ 2 | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  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: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6. | | | |

The reference measurement channels in Table A.3.4.3.4-7 apply with four CRS antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-7: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.100 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 5) |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frame 4,9 | Bits | 22920 |
| For Sub-Frames 1,6 | Bits | 14112 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 19080 |
| Number of Code Blocks  (Note 4) |  |  |
| For Sub-Frames 4,9 | Code blocks | 4 |
| For Sub-Frames 1,6 | Code blocks | 3 |
| For Sub-Frame 5 |  | n/a |
| For Sub-Frame 0 | Code blocks | 4 |
| Binary Channel Bits |  |  |
| For Sub-Frames 4,9 |  | 36800 |
| For Sub-Frames 1,6 |  | 26240 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 34112 |
| Max. Throughput averaged over 1 frame | Mbps | 9.3144 |
| UE Category |  | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  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: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6. | | |

#### 

#### A.3.4.3.5 Eight antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.5-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and eight CSI-RS antenna ports.

Table A.3.4.3.5-1: Fixed Reference Channel for CDM-multiplexed DM RS with eight CSI-RS antenna ports

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.50 TDD | R.50-1 TDD | R.50-2 TDD | R.50-3 TDD | R.50-4 TDD | R.50-5 TDD | R.50-6 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 50 (Note 4) | 50 (Note 4) | 50 (Note 6) | 25 (Note 7) | 50 (Note 4) | 75 (Note 8) | 100 (Note 9) |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation |  | QPSK | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 3624 | 3624 | 3624 | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 3624 | 3624 | 3624 | 17568 | 39232 | 61664 | 78704 |
| For Sub-Frames 1,6 |  | 2664 | 2664 | 3112 | 12216 | 26416 | 42368 | 61664 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 2984 | 2984 | 3368 | 13536 | 37888 | 57336 | 78704 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) |  | 1 | 1 | 1 | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) |  | 1 | 1 | 1 | 3 | 7 | 11 | 13 |
| For Sub-Frames 1,6 |  | 1 | 1 | 1 | 2 | 5 | 7 | 11 |
| For Sub-Frame 5 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 1 | 1 | 1 | 3 | 7 | 10 | 13 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 12000 | 13200 | 13200 | N/A | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 10400 | 11600 | 11600 | 33600 | 76800 | 115200 | 153600 |
| For Sub-Frames 1,6 |  | 7872 | 7872 | 8448 | 22848 | 55104 | 84672 | 118272 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9840 | 9840 | 10560 | 26112 | 70848 | 108864 | 152064 |
| Max. Throughput averaged over 1 frame | Mbps | 1.556 | 1.556 | 1.684 | 7.3104 | 16.9184 | 26.54 | 35.944 |
| UE Category |  | ≥ 1 | ≥ 1 | ≥ 1 | 8 | 8 | 8 | 8 |
| UE DL Category |  |  |  |  | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: as per Table 4.2-2 in TS 36.211 [4].  Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: 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 6: 50 resource blocks are allocated in sub-frames 4,9 and 47 resource blocks (RB0–RB23 and RB27–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. In sub-frame 0 and the DwPTS portion of sub-frames 1, 6, PDSCH is rate matched around RB22, RB23 and RB27.  Note 7: 25 resource blocks are allocated in sub-frames 4,9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 8: 75 resource blocks are allocated in sub-frames 4,9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 9: 100 resource blocks are allocated in sub-frames 4,9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 10: Given per component carrier per codeword. | | | | | | | | |

The reference measurement channels in Table A.3.4.3.5-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and eight CSI-RS antenna ports.

Table A.3.4.3.5-2: Fixed Reference Channel for eight antenna ports (CSI-RS)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.45  TDD | R.45-1  TDD | R.45-2 TDD | R.45A  TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |
| Allocated resource blocks |  | 504 | 39 | 504 | 504 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | 4+2 | 4+2 | 4+2 |
| Allocated subframes per Radio Frame |  | 5 | 5 | 10 | 5 |
| Modulation |  | 16QAM | 16QAM | 64QAM | 16QAM |
| Target Coding Rate |  | 1/2 | 1/2 |  | 1/2 |
| Information Bit Payload |  |  |  |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 11448 | 8760 | [18336] | 11448 |
| For Sub-Frames 1,6 | Bits | 7736 | 7480 | [11832] | 7736 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9528 | 8760 | [14688] | 9528 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) |  | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) |  | 2 | 2 |  | 2 |
| For Sub-Frames 1,6 |  | 2 | 2 |  | 2 |
| For Sub-Frame 5 |  | N/A | N/A |  | N/A |
| For Sub-Frame 0 |  | 2 | 2 |  | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A | N/A |  | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 22400 | 17472 | [33600] | 23200 |
| For Sub-Frames 1,6 | Bits | 15744 | 14976 | [23616] | 15744 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 18720 | [29520] | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 4.7896 | 4.1240 | 7.3296 | 4.7896 |
| UE Category |  | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.45 and R.45-2, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.45-1, 39 resource blocks are allocated in sub-frames 0,4,9 and the DwPTS portion of sub-frames 1,6 (RB0–RB20 and RB30–RB47).  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | | | | |

The reference measurement channels in Table A.3.4.3.5-3 apply for verifying CRI reporting accuracy with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.5-3: Fixed Reference Channel for eight antenna ports (CSI-RS)

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| Reference channel |  | R.44A-2 TDD | R.44A-3 TDD |
| Channel bandwidth | MHz | 10 | 10 |
| Uplink-Downlink Configuration (Note 3) |  | 2 | 2 |
| Allocated resource blocks |  | 504 | 504 |
| Allocated subframes per Radio Frame |  | 4+2 | 3+2 |
| Modulation |  | 64QAM | 64QAM |
| Target Coding Rate |  | 1/2 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 18336 | 18336 |
| For Sub-Frames (CSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frames 1,6 |  | 11832 | 11832 |
| For Sub-Frame 0 | Bits | 14688 | 14688 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) |  | 3 | 3 |
| For Sub-Frames (CSI-RS subframe) |  | N/A | N/A |
| For Sub-Frame 5 |  | N/A | N/A |
| For Sub-Frames 1,6 |  | 2 | 2 |
| For Sub-Frame 0 |  | 3 | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |  |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 36000 | 36000 |
| For Sub-Frames (CSI-RS subframe) | Bits | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frames 1,6 | Bits | 23616 | 23616 |
| For Sub-Frame 0 | Bits | 29520 | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 9.336 | 7.5024 |
| UE Category |  | ≥ 2 | ≥ 2 |
| Note 1: 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  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: For R.44A-2, 50 resource blocks are allocated in sub-frames 3, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and and the DwPTS portion of sub-frames 1,6. For R.44A-3, 50 resource blocks are allocated in sub-frames 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and and the DwPTS portion of sub-frames 1,6.  Note 5: 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) | | | |

Table A.3.4.3.5-4: Fixed Reference Channel for eight antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.108 TDD |
| Channel bandwidth | MHz | 10 |
| Uplink-Downlink Configuration (Note 3) |  | 2 |
| Allocated resource blocks |  | 44 |
| Allocated subframes per Radio Frame |  | 4 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 0,5 (Non CSI-RS subframe) | Bits | 472 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 472 |
| For Sub-Frames 1,6 |  | N/A |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frames 0,5 (Non CSI-RS subframe) |  | 1 |
| For Sub-Frames 4,9 (CSI-RS subframe) |  | 1 |
| For Sub-Frames 1,6 |  | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 0,5 (Non CSI-RS subframe) | Bits | 960 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 896 |
| For Sub-Frames 1,6 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 0.1888 |
| UE Category |  | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: Allocated PRB positions for PDSCH are {2, 3, 4, 5} within the assigned narrowband. Allocated PRB positions for MPDCCH are {0, 1} within the assigned narrowband.  Note 5: 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) | | |

#### A.3.4.3.6 Twelve antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.6-1 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and twelve CSI-RS antenna ports.

Table A.3.4.3.6-1: Fixed Reference Channel for twelve antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.77 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 504 |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Allocated subframes per Radio Frame |  | 10 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 16416 |
| For Sub-Frames 1,6 | Bits | 11832 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 14688 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) |  | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) |  | 3 |
| For Sub-Frames 1,6 |  | 2 |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 |  | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 32400 |
| For Sub-Frames 1,6 | Bits | 23616 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 7.1184 |
| UE Category |  | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | |

#### A.3.4.3.7 Sixteen antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.7-1 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and sixteen CSI-RS antenna ports.

Table A.3.4.3.7-1: Fixed Reference Channel for sixteen antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.78 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 504 |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Allocated subframes per Radio Frame |  | 10 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 9912 |
| For Sub-Frames 1,6 | Bits | 7736 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 9528 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) |  | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) |  | 2 |
| For Sub-Frames 1,6 |  | 2 |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 |  | 2 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 20800 |
| For Sub-Frames 1,6 | Bits | 15744 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 4.4824 |
| UE Category |  | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | |

#### A.3.4.3.8 Twenty-four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.8-1 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and twenty-four CSI-RS antenna ports.

Table A.3.4.3.8-1: Fixed Reference Channel for twenty-four antenna ports (CSI-RS)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | R.88 TDD | R.88A TDD | |
| Channel bandwidth | MHz | 10 | 10 | |
| Allocated resource blocks |  | 504 | 504 | |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 | 3+2 | |
| Allocated subframes per Radio Frame |  | 10 | 10 | |
| Modulation |  | 16QAM | 16QAM | |
| Target Coding Rate |  | 1/2 | 1/2 | |
| Information Bit Payload |  |  |  | |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A | N/A | |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 9912 | 11448 | |
| For Sub-Frames 1,6 | Bits | 7736 | 7736 | |
| For Sub-Frame 5 | Bits | N/A | N/A | |
| For Sub-Frame 0 | Bits | 9528 | 9528 | |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  | |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) |  | N/A | N/A | |
| For Sub-Frames 4 and 9  (CSI-RS subframe) |  | 2 | 2 | |
| For Sub-Frames 1,6 |  | 2 | 2 | |
| For Sub-Frame 5 |  | N/A | N/A | |
| For Sub-Frame 0 |  | 2 | 2 | |
| Binary Channel Bits Per Sub-Frame |  |  |  | |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A | N/A | |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 19200 | 22400 | |
| For Sub-Frames 1,6 | Bits | 15744 | 15744 | |
| For Sub-Frame 5 | Bits | N/A | N/A | |
| For Sub-Frame 0 | Bits | 19680 | 19680 | |
| Max. Throughput averaged over 1 frame | Mbps | 4.4824 | 4.7896 | |
| UE Category |  | ≥ 2 | ≥ 2 | |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | | |

#### A.3.4.3.9 Thirty-two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.9-1 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and thirty-two CSI-RS antenna ports.

Table A.3.4.3.9-1: Fixed Reference Channel for thirty-two antenna ports (CSI-RS)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.89 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 504 |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Allocated subframes per Radio Frame |  | 10 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 15264 |
| For Sub-Frames 1,6 | Bits | 11832 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 14688 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) |  | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) |  | 3 |
| For Sub-Frames 1,6 |  | 2 |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 |  | 3 |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4 and 9  (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9  (CSI-RS subframe) | Bits | 26400 |
| For Sub-Frames 1,6 | Bits | 23616 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 6.888 |
| UE Category |  | ≥ 2 |
| Note 1: 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 subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.  Note 5: 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 6: Localized allocation started from RB #0 is applied. | | |

## A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

### A.3.5.1 FDD

Table A.3.5.1-1: Reference Channel FDD

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | |
| Reference channel |  | R.15 FDD | R.15-1 FDD | R.15-2 FDD | R.16 FDD | R.16-1 FDD | R.16-2 FDD | R.16-3 FDD | R.16-4 FDD | R.17 FDD | R.17-1 FDD | R.17-2 FDD | R.17-3 FDD |
| Number of transmitter antennas |  | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 10 | 10 | 10 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 |
| Aggregation level | CCE | 8 | 8 | 8 | 4 | 2 | 4 | 2 | 4 | 2 | 2 | 1 | 4 |
| DCI Format |  | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cell ID |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Payload (without CRC) | Bits | 31 | 31 | 31 | 43 | 43 | 43 | 43 | 43 | 42 | 46 | 46 | 46 |

Table A.3.5.1-2: Void

### A.3.5.2 TDD

Table A.3.5.2-1: Reference Channel TDD

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | | | | |
| Reference channel |  | R.15 TDD | R.15-1 TDD | R.15-2 TDD | R.16 TDD | R.16-1 TDD | R.16-2 TDD | R.16-3 TDD | R.16-4 TDD | R.17 TDD | R.17-1 TDD | R.17-2 TDD | R.17-3 TDD |
| Number of transmitter antennas |  | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 10 | 10 | 10 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 |
| Aggregation level | CCE | 8 | 8 | 8 | 4 | 2 | 4 | 2 | 4 | 2 | 2 | 1 | 4 |
| DCI Format |  | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cell ID |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Payload (without CRC) | Bits | 34 | 34 | 34 | 46 | 46 | 46 | 46 | 46 | 45 | 49 | 49 | 49 |

Table A.3.5.2-2: Void

### A.3.5.3 LAA

Table A.3.5.3-1: Reference Channel for FS3 with FDD primary cell

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.3 FS3 |
| Number of transmitter antennas |  | 2 |
| Channel bandwidth | MHz | 20 |
| Number of OFDM symbols for PDCCH | symbols | 2 |
| Aggregation level | CCE | 4 |
| DCI Format |  | Format 2A |
| Cell ID |  | 0 |
| Payload (without CRC) | Bits | 48 |

Table A.3.5.3-2: Reference Channel for FS3 with TDD primary cell

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.4 FS3 |
| Number of transmitter antennas |  | 2 |
| Channel bandwidth | MHz | 20 |
| Number of OFDM symbols for PDCCH | symbols | 2 |
| Aggregation level | CCE | 4 |
| DCI Format |  | Format 2A |
| Cell ID |  | 0 |
| Payload (without CRC) | Bits | 51 |

## A.3.6 Reference measurement channels for PHICH performance requirements

Table A.3.6-1: Reference Channel FDD/TDD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.18 | R.19 | R.19-1 | R.20 | R.24 |
| Number of transmitter antennas |  | 1 | 2 | 2 | 4 | 1 |
| Channel bandwidth | MHz | 10 | 10 | 5 | 5 | 10 |
| User roles (Note 1) |  | W I1 I2 | W I1 I2 | W I1 I2 | W I1 I2 | W I1 |
| Resource allocation (Note 2) |  | (0,0) (0,1) (0,4) | (0,0) (0,1) (0,4) | (0,0) (0,1) (0,4) | (0,0) (0,1) (0,4) | (0,0) (0,1) |
| Power offsets (Note 3) | dB | -4 0 -3 | -4 0 -3 | -4 0 -3 | -4 0 -3 | +3 0 |
| Payload (Note 4) |  | A R R | A R R | A R R | A R R | A R |
| Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2.  Note 2: The resource allocation per user is given as (N\_group\_PHICH, N\_seq\_PHICH).  Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user.  Note 4: A=fixed ACK, R=random ACK/NACK. | | | | | | |

## A.3.7 Reference measurement channels for PBCH performance requirements

Table A.3.7-1: Reference Channel FDD/TDD

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | |
| Reference channel |  | R.21 | R.22 | R.23 | R.23-1 |
| Number of transmitter antennas |  | 1 | 2 | 4 | 1 |
| Channel bandwidth | MHz | 1.4 | 1.4 | 1.4 | 1.4 |
| Modulation |  | QPSK | QPSK | QPSK | QPSK |
| Target coding rate |  | 40/1920 | 40/1920 | 40/1920 | 40/4416 |
| Payload (without CRC) | Bits | 24 | 24 | 24 | 24 |

## A.3.8 Reference measurement channels for MBMS performance requirements

### A.3.8.1 FDD

Table A.3.8.1-1: Fixed Reference Channel QPSK R=1/3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  | R.40 FDD |  |  | R.37 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 |  |  | 50 |  |  |
| Allocated subframes per Radio Frame (Note 1) |  | 6 |  |  | 6 |  |  |
| Modulation |  | QPSK |  |  | QPSK |  |  |
| Target Coding Rate |  | 1/3 |  |  | 1/3 |  |  |
| Information Bit Payload (Note 2) |  | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 408 |  |  | 3624 |  |  |
| For Sub-Frames 0,4,5,9 | Bits | N/A |  |  | N/A |  |  |
| Number of Code Blocks per Subframe (Note 3) |  | 1 |  |  | 1 |  |  |
| Binary Channel Bits Per Subframe |  | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 1224 |  |  | 10200 |  |  |
| For Sub-Frames 0,4,5,9 | Bits | N/A |  |  | N/A |  |  |
| MBMS UE Category |  | ≥ 1 |  |  | ≥ 1 |  |  |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.  Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.  Note 3: 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). | | | | | | | |

Table A.3.8.1-2: Fixed Reference Channel 16QAM R=1/2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  |  |  | R.38 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 50 |  |  |
| Allocated subframes per Radio Frame (Note 1) |  |  |  |  | 6 |  |  |
| Modulation |  |  |  |  | 16QAM |  |  |
| Target Coding Rate |  |  |  |  | 1/2 |  |  |
| Information Bit Payload (Note 2) |  | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits |  |  |  | 9912 |  |  |
| For Sub-Frames 0,4,5,9 | Bits |  |  |  | N/A |  |  |
| Number of Code Blocks per Subframe (Note 3) |  |  |  |  | 2 |  |  |
| Binary Channel Bits Per Subframe |  | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits |  |  |  | 20400 |  |  |
| For Sub-Frames 0,4,5,9 | Bits |  |  |  | N/A |  |  |
| MBMS UE Category |  |  |  |  | ≥ 1 |  |  |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.  Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.  Note 3: 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). | | | | | | | |

Table A.3.8.1-3: Fixed Reference Channel 64QAM R=2/3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  |  | R.39-1 FDD | R.39 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Allocated subframes per Radio Frame(Note1) |  |  |  | 6 | 6 |  |  |
| Modulation |  |  |  | 64QAM | 64QAM |  |  |
| Target Coding Rate |  |  |  | 2/3 | 2/3 |  |  |
| Information Bit Payload (Note 2) |  | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits |  |  | 9912 | 19848 |  |  |
| For Sub-Frames 0,4,5,9 | Bits |  |  | N/A | N/A |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  | 2 | 4 |  |  |
| Binary Channel Bits Per Subframe |  | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits |  |  | 15300 | 30600 |  |  |
| For Sub-Frames 0,4,5,9 | Bits |  |  | N/A | N/A |  |  |
| MBMS UE Category |  |  |  | ≥ 1 | ≥ 2 |  |  |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.  Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.  Note 3: 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). | | | | | | | |

Table A.3.8.1-4: Fixed Reference Channel for subcarrier spacing 1.25kHz with FeMBMS MBMS/Unicast-mixed cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  | R.81-1 FDD | R.81-2 FDD |  |  |  |
| Channel bandwidth | MHz |  | 10 | 10 |  |  |  |
| Allocated resource blocks |  |  | 50 | 50 |  |  |  |
| Allocated subframes per Radio Frame(Note1) |  |  | 8 | 8 |  |  |  |
| Modulation |  |  | 16QAM | 64QAM |  |  |  |
| Target Coding Rate |  |  | 1/2 | 2/3 |  |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 11448 | 25456 |  |  |  |
| For Sub-Frames 0,5 |  |  | N/A | N/A |  |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  | 3 | 5 |  |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  | 24000 | 36000 |  |  |  |
| For Sub-Frames 0,5 |  |  | N/A | N/A |  |  |  |
| MBMS UE Category |  |  | ≥ 2 | ≥ 2 |  |  |  |
| Note 1: For FDD mode, up to 8 subframes (#1/2/3/4/6/7/8/9) are available for MBMS, in line with TS 36.331 [7].  Note 2: Zero OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.8.1-5: Fixed Reference Channel for subcarrier spacing 7.5kHz with FeMBMS MBMS/Unicast-mixed cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  |  | R.82-1 FDD |  |  |  |
| Channel bandwidth | MHz |  |  | 10 |  |  |  |
| Allocated resource blocks |  |  |  | 50 |  |  |  |
| Allocated subframes per Radio Frame(Note1) |  |  |  | 8 |  |  |  |
| Modulation |  |  |  | 16QAM |  |  |  |
| Target Coding Rate |  |  |  | 1/2 |  |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 12960 |  |  |  |
| For Sub-Frames 0,5 | Bits |  |  | N/A |  |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  | 3 |  |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 25200 |  |  |  |
| For Sub-Frames 0,5 | Bits |  |  | N/A |  |  |  |
| MBMS UE Category |  |  |  | ≥ 2 |  |  |  |
| Note 1: For FDD mode, up to 8 subframes (#1/2/3/4/6/7/8/9) are available for MBMS, in line with TS 36.331 [7].  Note 2: Zero OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.8.1-6: Fixed Reference Channel for subcarrier spacing 1.25kHz with MBMS dedicated cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  | R.83-1 FDD | R.83-2 FDD |  |  |  |
| Channel bandwidth | MHz |  | 10 | 10 |  |  |  |
| Allocated resource blocks |  |  | 50 | 50 |  |  |  |
| Allocated subframes per Radio Frame(Note1) |  |  | 10 | 10 |  |  |  |
| Modulation |  |  | 16QAM | 64QAM |  |  |  |
| Target Coding Rate |  |  | 1/2 | 2/3 |  |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits |  | 11448 | 25456 |  |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  | 3 | 5 |  |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits |  | 24000 | 36000 |  |  |  |
| MBMS UE Category |  |  | ≥ 2 | ≥ 2 |  |  |  |
| Note 1: For FDD mode, all 10 subframes are available for MBMS, in line with TS 36.331 [7].  Note 2: Zero OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.8.1-7: Fixed Reference Channel for subcarrier spacing 7.5kHz with with MBMS dedicated cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  | R.84-1 FDD |  |  |  |  |
| Channel bandwidth | MHz |  | 10 |  |  |  |  |
| Allocated resource blocks |  |  | 50 |  |  |  |  |
| Allocated subframes per Radio Frame(Note1) |  |  | 10 |  |  |  |  |
| Modulation |  |  | 16QAM |  |  |  |  |
| Target Coding Rate |  |  | 1/2 |  |  |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits |  | 12960 |  |  |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  | 3 |  |  |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits |  | 25200 |  |  |  |  |
| MBMS UE Category |  |  | ≥ 2 |  |  |  |  |
| Note 1: For FDD mode, all 10 subframes are available for MBMS, in line with TS 36.331 [7].  Note 2: Zero OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.8.1-8: Fixed Reference Channel for subcarrier spacing 15kHz with with MBMS dedicated cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  | R.85-1 FDD | R.85-2 FDD | R.85-3 FDD |  |  |
| Channel bandwidth | MHz |  | 3 | 5 | 10 |  |  |
| Allocated resource blocks |  |  | 15 | 25 | 50 |  |  |
| Allocated subframes per Radio Frame(Note1) |  |  | 10 | 10 | 10 |  |  |
| Modulation |  |  | QPSK | 16QAM | 64QAM |  |  |
| Target Coding Rate |  |  | 1/3 | 1/2 | 2/3 |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits |  | 1064 | 4968 | 19848 |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  | 1 | 1 | 4 |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits |  | 3060 | 10200 | 30600 |  |  |
| MBMS UE Category |  |  | ≥ 1 | ≥ 1 | ≥ 2 |  |  |
| Note 1: For FDD mode, all 10 subframes are available for MBMS, in line with TS 36.331 [7].  Note 2: 2 OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.8.1-9: Fixed Reference Channel for subcarrier spacing 0.37 kHz with 5G terrestrial broadcast MBMS dedicated cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  | R.106-1 FDD | R.106-2  FDD |  |  |  |
| Channel bandwidth | MHz |  | 10 | 10 |  |  |  |
| Allocated resource blocks |  |  | 50 | 50 |  |  |  |
| Allocated slots per 40ms(Note1) |  |  | 13 | 13 |  |  |  |
| Modulation |  |  | 64QAM | 64QAM |  |  |  |
| Target Coding Rate |  |  | 0.48 | 0.52 |  |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For each slot | Bits |  | 63776 | 63776 |  |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  | 11 | 11 |  |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For each slot | Bits |  | 133650 | 121500 |  |  |  |
| MBMS UE Category |  |  | ≥ 2 | ≥ 2 |  |  |  |
| Note 1: First subframe of every 40ms is allocated for non-MBMS transmission.  Note 2: Zero OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

Table A.3.8.1-10: Fixed Reference Channel for subcarrier spacing 2.5 kHz with 5G terrestrial broadcast MBMS dedicated cell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  | R.107 FDD |  |  |  |  |
| Channel bandwidth | MHz |  | 10 |  |  |  |  |
| Allocated resource blocks |  |  | 50 |  |  |  |  |
| Allocated subframes per 40ms(Note1) |  |  | 39 |  |  |  |  |
| Modulation |  |  | 16QAM |  |  |  |  |
| Target Coding Rate |  |  | 0.46 |  |  |  |  |
| Information Bit Payload (Note 2) |  |  |  |  |  |  |  |
| For each subframes | Bits |  | 9912 |  |  |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  | 2 |  |  |  |  |
| Binary Channel Bits Per Subframe |  |  |  |  |  |  |  |
| For each subframes | Bits |  | 21600 |  |  |  |  |
| MBMS UE Category |  |  | ≥ 2 |  |  |  |  |
| Note 1: First subframe of every 40ms is allocated for non-MBMS transmission.  Note 2: Zero OFDM symbols are reserved for PDCCH; and no CRS allocated as per TS 36.211 [4].  Note 3: 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). | | | | | | | |

### A.3.8.2 TDD

Table A.3.8.2-1: Fixed Reference Channel QPSK R=1/3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  | R.40 TDD |  |  | R.37 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  | 6 |  |  | 50 |  |  |
| Uplink-Downlink Configuration(Note 1) |  | **5** |  |  | **5** |  |  |
| Allocated subframes per Radio Frame |  | 5 |  |  | 5 |  |  |
| Modulation |  | QPSK |  |  | QPSK |  |  |
| Target Coding Rate |  | 1/3 |  |  | 1/3 |  |  |
| Information Bit Payload (Note 2) |  | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | 408 |  |  | 3624 |  |  |
| For Sub-Frames 0,1,2,5,6 | Bits | N/A |  |  | N/A |  |  |
| Number of Code Blocks per Subframe (Note 3) |  | 1 |  |  | 1 |  |  |
| Binary Channel Bits Per Subframe |  | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | 1224 |  |  | 10200 |  |  |
| For Sub-Frames 0,1,2,5,6 | Bits | N/A |  |  | N/A |  |  |
| MBMS UE Category |  | ≥ 1 |  |  | ≥ 1 |  |  |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.  Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.  Note 3: 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). | | | | | | | |

Table A.3.8.2-2: Fixed Reference Channel 16QAM R=1/2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  |  |  | R.38 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 50 |  |  |
| Uplink-Downlink Configuration(Note 1) |  |  |  |  | **5** |  |  |
| Allocated subframes per Radio Frame |  |  |  |  | 5 |  |  |
| Modulation |  |  |  |  | 16QAM |  |  |
| Target Coding Rate |  |  |  |  | 1/2 |  |  |
| Information Bit Payload (Note 2) |  | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits |  |  |  | 9912 |  |  |
| For Sub-Frames 0,1,2,5,6 | Bits |  |  |  | N/A |  |  |
| Number of Code Blocks per Subframe (Note 3) |  |  |  |  | 2 |  |  |
| Binary Channel Bits Per Subframe |  | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits |  |  |  | 20400 |  |  |
| For Sub-Frames 0,1,2,5,6 | Bits |  |  |  | N/A |  |  |
| MBMS UE Category |  |  |  |  | ≥ 1 |  |  |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.  Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.  Note 3: 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). | | | | | | | |

Table A.3.8.2-3: Fixed Reference Channel 64QAM R=2/3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | PMCH | | | | | | |
| Unit | Value | | | | | |
| Reference channel |  |  |  | R.39-1TDD | R.39 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Uplink-Downlink Configuration(Note 1) |  |  |  | **5** | **5** |  |  |
| Allocated subframes per Radio Frame |  |  |  | 5 | 5 |  |  |
| Modulation |  |  |  | 64QAM | 64QAM |  |  |
| Target Coding Rate |  |  |  | 2/3 | 2/3 |  |  |
| Information Bit Payload (Note 2) |  | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits |  |  | 9912 | 19848 |  |  |
| For Sub-Frames 0,1,2,5,6 | Bits |  |  | N/A | N/A |  |  |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |  | 2 | 4 |  |  |
| Binary Channel Bits Per Subframe |  | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits |  |  | 15300 | 30600 |  |  |
| For Sub-Frames 0,1,2,5,6 | Bits |  |  | N/A | N/A |  |  |
| MBMS UE Category |  |  |  | ≥ 1 | ≥ 2 |  |  |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.  Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.  Note 3: 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). | | | | | | | |

## A.3.9 Reference measurement channels for sustained downlink data rate provided by lower layers

### A.3.9.1 FDD

Table A.3.9.1-1: Fixed Reference Channel for sustained data-rate test (FDD 64QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | |
| Reference channel |  | R.31-1 FDD | R.31-2 FDD | R.31-3 FDD | R.31-3A FDD | R.31-3C FDD | R.31-4 FDD | R.31-4B FDD | R.31-5 FDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 10 | 15 | 20 | 15 | 15 |
| Allocated resource blocks (Note 8) |  | Note 5 | Note 6 | Note 7 | Note 6 | Note 10 | Note 7 | Note 11 | Note 9 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Coding Rate |  |  |  |  |  |  |  |  |  |
| For Sub-Frame 1,2,3,4,6,7,8,9, |  | 0.40 | 0.59 | 0.59 | 0.85 | 0.87 | 0.88 | 0.85 | 0.85 |
| For Sub-Frame 5 |  | 0.40 | 0.64 | 0.62 | 0.89 | 0.88 | 0.87 | 0.87 | 0.91 |
| For Sub-Frame 0 |  | 0.40 | 0.63 | 0.61 | 0.90 | 0.91 | 0.90 | 0.88 | 0.88 |
| Information Bit Payload (Note 8) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 | 55056 |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 35160 | 51024 | 71112 | 52752 | 52752 |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 | 55056 |
| Number of Code Blocks (Notes 3 and 8) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 | 9 |
| For Sub-Frame 5 | Bits | 2 | 5 | 9 | 6 | 9 | 12 | 9 | 9 |
| For Sub-Frame 0 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 | 9 |
| Binary Channel Bits (Note 8) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 26100 | 43200 | 86400 | 43200 | 58752 | 86400 | 64800 | 64800 |
| For Sub-Frame 5 | Bits | 26100 | 39744 | 82080 | 39744 | 57888 | 82080 | 60480 | 60480 |
| For Sub-Frame 0 | Bits | 26100 | 40752 | 83952 | 40752 | 56304 | 83952 | 62352 | 62352 |
| Number of layers |  | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 8) | Mbps | 10.296 | 25.456 | 51.024 | 36.542 | 51.024 | 74.950 | 54.826 | 54.826 |
| UE Categories |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 | ≥ 3 | ≥ 4 | ≥ 3 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 5: Resource blocks nPRB = 6..14,30..49 are allocated for the user data in all sub-frames.  Note 6: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Given per component carrier per codeword.  Note 9: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 10: Resource blocks nPRB = 4..71 are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.  Note 11: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | | | | | |

Table A.3.9.1-2: Fixed Reference Channel for sustained data-rate test (FDD 64QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | |
| Reference channel |  | R.31-6 FDD | R.31-7 FDD | R.31-8 FDD | R.31-9 FDD | R.31-10 FDD | R.31-1A FDD |  |  |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 | 5 | 20 |  |  |
| Allocated resource blocks (Note 5) |  | Note 4 | Note 7 | Note 8 | Note 9 | Note 4 | Note 10 |  |  |
| Allocated subframes per Radio Frame |  | 9 | 10 | 10 | 10 | 9 | 10 |  |  |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |  |  |
| Coding Rate |  |  |  |  |  |  |  |  |  |
| For Sub-Frame 1,2,3,4,6,7,8,9, |  | 0.85 | 0.78 | 0.77 | 0.79 | 0.78 | 0.41 |  |  |
| For Sub-Frame 5 |  | N/A | 0.80 | 0.79 | 0.81 | N/A | 0.41 |  |  |
| For Sub-Frame 0 |  | 0.83 | 0.83 | 0.8 | 0.81 | 0.85 | 0.41 |  |  |
| Information Bit Payload (Note 5) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 18336 | 63776 | 93800 | 128496 | 31704 | 10296 |  |  |
| For Sub-Frame 5 | Bits | N/A | 59256 | 90816 | 124464 | N/A | 10296 |  |  |
| For Sub-Frame 0 | Bits | 15840 | 63776 | 93800 | 128496 | 30576 | 10296 |  |  |
| Number of Code Blocks (Notes 3 and 5) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 3 | 11 | 16 | 21 | 6 | 2 |  |  |
| For Sub-Frame 5 | Bits | N/A | 10 | 15 | 21 | N/A | 2 |  |  |
| For Sub-Frame 0 | Bits | 3 | 11 | 16 | 21 | 5 | 2 |  |  |
| Binary Channel Bits (Note 5) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 21600 | 81600 | 122400 | 163200 | 40800 | 25200 |  |  |
| For Sub-Frame 5 | Bits | N/A | 74976 | 114144 | 154944 | N/A | 25200 |  |  |
| For Sub-Frame 0 | Bits | 19152 | 76992 | 117792 | 158592 | 36192 | 25200 |  |  |
| Number of layers |  | 2 | 4 | 4 | 4 | 4 | 1 |  |  |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 17.837 | 63.324 | 93.502 | 128.093 | 28.421 | 10.296 |  |  |
| UE Categories |  | ≥ 2 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 1 |  |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 5: Given per component carrier per codeword.  Note 6: Ng=1/6.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 10: Resource blocks nPRB = 8..35 are allocated for the user data in all sub-frames. | | | | | | | | | |

Table A.3.9.1-3: Fixed Reference Channel for sustained data-rate test (FDD 256QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |  |
| Reference channel |  | R.68 FDD | R.68-1 FDD | R.68-2 FDD | R.68-3 FDD | R.68-4 FDD | R.68-5 FDD | R.68-6 FDD | R.68-7 FDD |
| Channel bandwidth | MHz | 20 | 15 | 10 | 5 | 10 | 15 | 20 | 5 |
| Allocated resource blocks (Note 4) |  | Note 5 | Note 6 | Note 7 | Note 8 | Note 7 | Note 6 | Note 5 | Note 8 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Coding Rate |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 0.85 | 0.88 | 0.85 | 0.85 | 0.78 | 0.79 | 0.78 | 0.85 |
| For Sub-Frames 1,2,6,7 |  | 0.74 | 0.74 | 0.74 | 0.77 | 0.78 | 0.79 | 0.78 | 0.77 |
| For Sub-Frame 5 |  | 0.75 | 0.77 | 0.77 | 0.79 | 0.82 | 0.82 | 0.786 | 0.79 |
| For Sub-Frame 0 |  | 0.76 | 0.77 | 0.78 | 0.84 | 0.83 | 0.82 | 0.80 | 0.84 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 97896 | 75376 | 48936 | 24496 | 84760 | 128496 | 169544 | 42368 |
| For Sub-Frames 1,2,6,7 |  | 84760 | 63776 | 42368 | 21384 | 84760 | 128496 | 169544 | 42368 |
| For Sub-Frame 5 | Bits | 81176 | 61664 | 40576 | 19848 | 81176 | 124464 | 161760 | 39232 |
| For Sub-Frame 0 | Bits | 84760 | 63776 | 42368 | 21384 | 84760 | 128496 | 169544 | 39232 |
| Number of Code Blocks (Notes 3 and 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 16 | 13 | 8 | 4 | 14 | 21 | 28 | 7 |
| For Sub-Frames 1,2,6,7 |  | 14 | 11 | 7 | 4 | 14 | 21 | 28 | 7 |
| For Sub-Frame 5 | Bits | 14 | 11 | 7 | 4 | 14 | 21 | 27 | 7 |
| For Sub-Frame 0 | Bits | 14 | 11 | 7 | 4 | 14 | 21 | 28 | 7 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 115200 | 86400 | 57600 | 28800 | 108800 | 163200 | 217600 | 54400 |
| For Sub-Frames 1,2,6,7 |  | 115200 | 86400 | 57600 | 28800 | 108800 | 163200 | 217600 | 54400 |
| For Sub-Frame 5 | Bits | 109440 | 80640 | 52992 | 25344 | 99968 | 152192 | 206592 | 47744 |
| For Sub-Frame 0 | Bits | 111936 | 83136 | 54336 | 25536 | 102656 | 157056 | 211456 | 48256 |
| Number of layers |  | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 89.656 | 68.205 | 44.816 | 22.475 | 84.4016 | 128.093 | 168.766 | 41.741 |
| UE Categories |  | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 |
| UE DL Categories |  | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | 13-14 | 13-14 | 13-14 | 13-14 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 6: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 2..24 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | | | | | |

Table A.3.9.1-4: Fixed Reference Channel for sustained data-rate test (FDD 1024QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | |
| Reference channel |  | R.105 FDD | R.105-1 FDD | R.105-2 FDD | R.105-3 FDD | R.105-4 FDD | R.105-5 FDD | R.105-6 FDD | R.105-7 FDD |
| Channel bandwidth | MHz | 20 | 15 | 10 | 5 | 20 | 15 | 10 | 5 |
| Allocated resource blocks (Note 4) |  | Note 5 | Note 6 | Note 7 | Note 8 | Note 7 | Note 6 | Note 5 | Note 8 |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM | 1024QA M | 1024QA M | 1024QA M | 1024QA M | 1024QAM |
| Coding Rate |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 |  | 0.76 | 0.75 | 0.73 | 0.76 | 0.81 | 0.79 | 0.81 | 0.78 |
| For Sub-Frames 1,2,6,7 |  | 0.76 | 0.75 | 0.73 | 0.76 | 0.81 | 0.79 | 0.81 | 0.78 |
| For Sub-Frame 5 |  | 0.77 | 0.78 | 0.77 | 0.80 | 0.82 | 0.83 | 0.81 | 0.82 |
| For Sub-Frame 0 |  | 0.79 | 0.78 | 0.78 | 0.86 | 0.83 | 0.82 | 0.86 | 0.87 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 110136 | 81176 | 52752 | 27376 | 220296 | 161760 | 110136 | 52752 |
| For Sub-Frames 1,2,6,7 |  | 110136 | 81176 | 52752 | 27376 | 220296 | 161760 | 110136 | 52752 |
| For Sub-Frame 5 | Bits | 105528 | 78704 | 51024 | 25456 | 211936 | 157432 | 101840 | 48936 |
| For Sub-Frame 0 | Bits | 110136 | 81176 | 52752 | 27376 | 220296 | 161760 | 110136 | 52752 |
| Number of Code Blocks (Notes 3,and 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 18 | 14 | 9 | 5 | 36 | 27 | 18 | 9 |
| For Sub-Frames 1,2,6,7 |  | 18 | 14 | 9 | 5 | 36 | 27 | 18 | 9 |
| For Sub-Frame 5 | Bits | 18 | 13 | 9 | 5 | 35 | 26 | 17 | 8 |
| For Sub-Frame 0 | Bits | 18 | 14 | 9 | 5 | 36 | 27 | 18 | 9 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 3,4,8,9 | Bits | 144000 | 108000 | 72000 | 36000 | 272000 | 204000 | 136000 | 68000 |
| For Sub-Frames 1,2,6,7 |  | 144000 | 108000 | 72000 | 36000 | 272000 | 204000 | 136000 | 68000 |
| For Sub-Frame 5 | Bits | 136800 | 100800 | 66240 | 31680 | 258240 | 190240 | 124960 | 59680 |
| For Sub-Frame 0 | Bits | 139920 | 103920 | 67920 | 31920 | 264320 | 196320 | 128320 | 60320 |
| Number of layers |  | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 109.68 | 80.93 | 52.58 | 27.18 | 219.46 | 161.33 | 109.31 | 52.37 |
| UE DL Categories |  | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 6: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 2..24 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | | | | | |

### A.3.9.2 TDD

Table A.3.9.2-1: Fixed Reference Channel for sustained data-rate test (TDD 64QAM)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | | |
| Reference channel |  | R.31-1 TDD | R.31-2 TDD | R.31-3 TDD | R.31-3A TDD | R.31-4 TDD | R.31-4A TDD | R.31-5 TDD | R.31-5A TDD | R.31-6 TDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 15 | 20 | 20 | 15 | 15 | 10 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 | Note 8 | Note 8 | Note 11 | Note 11 | Note 7 |
| Uplink-Downlink Configuration (Note 3) |  | 5 | 5 | 5 | 1 | 1 | 2 | 1 | 2 | 1 |
| Number of HARQ Processes per component carrier | Processes | 15 | 15 | 15 | 7 | 7 | 10 | 7 | 10 | 7 |
| Allocated subframes per Radio Frame (D+S) |  | 8+1 | 8+1 | 8+1 | 4 | 4 | 6+2 | 4 | 6+2 | 4 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 0.40 | 0.59 | 0.59 | 0.87 | 0.88 | 0.88 | 0.85 | 0.85 | 0.85 |
| For Sub-Frames 3,8 |  | 0.40 | 0.59 | 0.59 | N/A | N/A | 0.88 | N/A | 0.85 | N/A |
| For Sub-Frame 7 |  | 0.40 | 0.59 | 0.59 | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 0 |  | 0.40 | 0.62 | 0.61 | 0.90 | 0.90 | 0.90 | 0.88 | 0.88 | 0.90 |
| For Sub-Frames 1 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 5 |  | 0.40 | 0.64 | 0.62 | 0.88 | 0.87 | 0.87 | 0.87 | 0.87 | 0.88 |
| For Sub-Frames 6 |  | 0.40 | 0.60 | 0.60 | N/A | N/A | N/A | N/A | N/A | N/A |
| Information Bit Payload |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 | 75376 | 55056 | 55056 | 36696 |
| For Sub-Frames 3,8 | Bits | 10296 | 25456 | 51024 | 0 | 0 | 75376 | 0 | 55056 | 0 |
| For Sub-Frame 7 | Bits | 10296 | 25456 | 51024 | 0 | 0 | N/A | 0 | N/A | 0 |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 | 75376 | 55056 | 55056 | 36696 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 51024 | 71112 | 71112 | 52752 | 52752 | 35160 |
| For Sub-Frame 6 | Bits | 10296 | 25456 | 51024 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 2 | 5 | 9 | 9 | 13 | 13 | 9 | 9 | 6 |
| For Sub-Frames 3,8 |  | 2 | 5 | 9 | N/A | N/A | 13 | N/A | 9 | N/A |
| For Sub-Frame 7 |  | 2 | 5 | 9 | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 |  | 2 | 5 | 9 | 9 | 13 | 13 | 9 | 9 | 6 |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | 2 | 5 | 9 | 9 | 12 | 12 | 9 | 9 | 6 |
| For Sub-Frame 6 | Bits | 2 | 5 | 9 | n/a | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 26100 | 43200 | 86400 | 58752 | 86400 | 86400 | 64800 | 64800 | 43200 |
| For Sub-Frames 3,8 | Bits | 26100 | 43200 | 86400 | 0 | 0 | 86400 | 0 | 64800 | 0 |
| For Sub-Frame 7 | Bits | 26100 | 43200 | 86400 | 0 | 0 | 86400 | 0 | 64800 | 0 |
| For Sub-Frame 0 | Bits | 26100 | 41184 | 84384 | 56736 | 84384 | 84384 | 62784 | 62784 | 41184 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 5 | Bits | 26100 | 40176 | 82512 | 58320 | 82512 | 82512 | 60912 | 60912 | 40176 |
| For Sub-Frame 6 | Bits | 26100 | 42768 | 85968 | N/A | N/A | 0 | N/A | 0 | N/A |
| Number of layers |  | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 10) | Mbps | 8.237 | 20.365 | 40.819 | 20.409 | 29.724 | 52.337 | 25.330 | 38.309 | 14.525 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 | ≥ 3 | ≥ 3 | ≥ 3 | ≥ 2 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 6..14,30..49 are allocated for the user data in all subframes.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in the available downlink sub-frames according to uplink downlink configurations used .  Note 8: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..71 are allocated for the user data in all sub-frames  Note10: Given per component carrier per codeword.  Note11: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in other downlink sub-frames. | | | | | | | | | | |

Table A.3.9.2-1A: Fixed Reference Channel for sustained data-rate test (TDD 64QAM)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | | | | | | | |
| Reference channel |  | R.31-7 TDD | R.31-8 TDD | R.31-9 TDD | R.31-1A TDD | R.31-10 TDD | R.31-11 TDD | R.31-12 TDD |  |
| Channel bandwidth | MHz | 10 | 15 | 20 | 20 | 10 | 15 | 20 |  |
| Allocated resource blocks |  | Note 7 | Note 11 | Note 12 | Note 13 | Note 14 | Note 15 | Note 16 |  |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 5 | 1 | 1 | 1 |  |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | 15 | 7 | 7 | 7 |  |
| Allocated subframes per Radio Frame (D+S) |  | 4 | 4 | 4 | 8+1 | 4 | 4 | 4 |  |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |  |
| Target Coding Rate |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 0.78 | 0.77 | 0.79 | 0.41 | 0.85 | 0.84 | 0.85 |  |
| For Sub-Frames 3,8 |  | N/A | N/A | N/A | 0.41 | N/A | N/A | N/A |  |
| For Sub-Frame 7 |  | N/A | N/A | N/A | 0.41 | N/A | N/A | N/A |  |
| For Sub-Frames 0 |  | 0.82 | 0.79 | 0.81 | 0.41 | 0.75 | 0.76 | 0.74 |  |
| For Sub-Frames 1 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |  |
| For Sub-Frames 5 |  | 0.79 | 0.79 | 0.80 | 0.41 | 0.75 | 0.76 | 0.75 |  |
| For Sub-Frames 6 |  | N/A | N/A | N/A | 0.41 | N/A | N/A | N/A |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 63776 | 93800 | 128496 | 10296 | 110136 | 161760 | 220296 |  |
| For Sub-Frames 3,8 | Bits | 0 | 0 | 0 | 10296 | N/A | N/A | N/A |  |
| For Sub-Frame 7 | Bits | 0 | 0 | 0 | 10296 | N/A | N/A | N/A |  |
| For Sub-Frame 0 | Bits | 63776 | 93800 | 128496 | 10296 | 87936 | 137792 | 187712 |  |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| For Sub-Frame 5 | Bits | 59256 | 90816 | 124464 | 10296 | 81176 | 128496 | 181656 |  |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 10296 | 0 | 0 | 0 |  |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 11 | 16 | 21 | 2 | 18 | 27 | 36 |  |
| For Sub-Frames 3,8 |  | N/A | N/A | N/A | 2 | N/A | N/A | N/A |  |
| For Sub-Frame 7 |  | N/A | N/A | N/A | 2 | N/A | N/A | N/A |  |
| For Sub-Frame 0 |  | 11 | 16 | 21 | 2 | 15 | 23 | 31 |  |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |  |
| For Sub-Frame 5 |  | 10 | 15 | 21 | 2 | 14 | 21 | 30 |  |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | 2 | N/A | N/A | N/A |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 81600 | 122400 | 163200 | 25200 | 129600 | 194400 | 259200 |  |
| For Sub-Frames 3,8 | Bits | 0 | 0 | 0 | 25200 | 0 | 0 | 0 |  |
| For Sub-Frame 7 | Bits | 0 | 0 | 0 | 25200 | 0 | 0 | 0 |  |
| For Sub-Frame 0 | Bits | 77856 | 118656 | 159456 | 25200 | 118080 | 181440 | 253440 |  |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| For Sub-Frame 5 | Bits | 75840 | 115008 | 155808 | 25200 | 109440 | 169920 | 241920 |  |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 25200 | 0 | 0 | 0 |  |
| Number of layers |  | 4 | 4 | 4 | 1 | 8 | 8 | 8 |  |
| Max. Throughput averaged over 1 frame (Note 10) | Mbps | 25.058 | 37.222 | 50.996 | 8.237 | 77.877 | 117.962 | 161.992 |  |
| UE Category |  | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 1 | 8 | 8 | 8 |  |
| UE DL Category |  |  |  |  |  | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: The first RBG, i.e. resource blocks nPRB = 0..2 for 10MHz channel bandwidth, nPRB = 0..3 for 15MHz and 20MHz channel bandwidths are allocated for SIB transmissions in sub-frame 5.  Note 6: Void  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in other available downlink sub-frames according to uplink downlink configurations used .  Note 8: Void  Note 9: Void  Note10: Given per component carrier per codeword.  Note11: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in other downlink sub-frames.  Note 12: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in other downlink sub-frames.  Note 13: Resource blocks nPRB = 8..35 are allocated for the user data in all sub-frames.  Note 14: 84 resource blocks nPRB = 4..43 and nPRB = 56..99 are allocated for the user data in sub-frame 5, and 88 resource blocks nPRB = 0..43 and nPRB = 56..99 are allocated for the user data in sub-frame 0,and 100 resource blocks nPRB = 0..99 in other downlink sub-frames.  Note 15: 59 resource blocks nPRB = 4..31 and nPRB = 44...74 are allocated for the user data in sub-frame 5, and 63 resource blocks nPRB = 0..31 and nPRB = 44..74 are allocated for the user data in sub-frame 0, and 75 resource blocks nPRB = 0..74 in other downlink sub-frames.  Note 16: 38 resource blocks nPRB = 3..20 and nPRB = 30..49 are allocated for the user data in sub-frame 5, and 41 resource blocks nPRB = 0..20 and nPRB = 30..49 are allocated for the user data in sub-frame 0, and 50 resource blocks nPRB = 0..49 in other available downlink sub-frames according to uplink downlink configurations used. | | | | | | | | | |

Table A.3.9.2-2: Fixed Reference Channel for sustained data-rate test (TDD 256QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.68 TDD | R.68-1 TDD | R.68-2 TDD | R.68-3 TDD | R.68-4 TDD |  |
| Channel bandwidth | MHz | 20 | 15 | 10 | 20 | 15 |  |
| Allocated resource blocks | PRB | Note 6 | Note 7 | Note 8 | Note 6 | Note 7 |  |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | [2] | [2] |  |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | [10] | [10] |  |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | 4+2 | 4+2 | [6+2] | [6+2] |  |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |  |
| Target Coding Rate |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 0.76 | 0.77 | 0.78 | 0.76 | 0.77 |  |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A |  |
| For Sub-Frames 3 |  | N/A | N/A | N/A | 0.74 | 0.79 |  |
| For Sub-Frames 4 |  | 0.74 | 0.79 | 0.74 | 0.74 | 0.79 |  |
| For Sub-Frame 5 |  | 0.74 | 0.76 | 0.76 | 0.74 | 0.76 |  |
| For Sub-Frame 6 |  | N/A | N/A | N/A | [N/A] | [N/A] |  |
| For Sub-Frame 7 |  | N/A | N/A | N/A | [N/A] | [N/A] |  |
| For Sub-Frames 8 |  | N/A | N/A | N/A | 0.85 | 0.88 |  |
| For Sub-Frames 9 |  | 0.85 | 0.88 | 0.85 | 0.85 | 0.88 |  |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 84760 | 63776 | 42368 | 84760 | 63776 |  |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 |  |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | 84760 | 63776 |  |
| For Sub-Frames 4 | Bits | 84760 | 63776 | 42368 | 84760 | 63776 |  |
| For Sub-Frame 5 | Bits | 81176 | 61664 | 40576 | 81176 | 61664 |  |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | [0] | [0] |  |
| For Sub-Frame 7 |  | N/A | N/A | N/A | [N/A] | [N/A] |  |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | 97896 | 75376 |  |
| For Sub-Frames 9 | Bits | 97896 | 75376 | 48936 | 97896 | 75376 |  |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 14 | 11 | 7 | 14 | 11 |  |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A |  |
| For Sub-Frames 3 |  | N/A | N/A | N/A | 14 | 11 |  |
| For Sub-Frames 4 |  | 14 | 11 | 7 | 14 | 11 |  |
| For Sub-Frame 5 |  | 14 | 11 | 7 | 14 | 11 |  |
| For Sub-Frame 6 |  | N/A | N/A | N/A | [N/A] | [11] |  |
| For Sub-Frame 7 |  | N/A | N/A | N/A | [N/A] | [11] |  |
| For Sub-Frames 8 |  | N/A | N/A | N/A | 16 | 13 |  |
| For Sub-Frames 9 |  | 16 | 13 | 8 | 16 | 13 |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 112512 | 83712 | 54912 | 112512 | 83712 |  |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 |  |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | 115200 | 86400 |  |
| For Sub-Frames 4 | Bits | 115200 | 86400 | 57600 | 115200 | 86400 |  |
| For Sub-Frame 5 |  | 110016 | 81216 | 53568 | 110016 | 81216 |  |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | [0] | [0] |  |
| For Sub-Frame 7 |  | N/A | N/A | N/A | [N/A] | [N/A] |  |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | 115200 | 86400 |  |
| For Sub-Frames 9 | Bits | 115200 | 86400 | 57600 | 115200 | 86400 |  |
| Number of layers |  | 2 | 2 | 2 | 2 | 2 |  |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 34.859 | 26.459 | 17.425 | [53.125] | [40.374] |  |
| UE Categories |  | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 |  |
| UE DL Categories |  | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 |  |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword.  Note 6: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in other downlink sub-frames.  Note 7: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in other downlink sub-frames.  Note 8: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in the available downlink sub-frames according to uplink downlink configurations used. | | | | | | | |

Table A.3.9.2-3: Fixed Reference Channel for sustained data-rate test (TDD 256QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.68-5 TDD | R.68-6 TDD | R.68-7 TDD | R.68-8 TDD | R.68-9 TDD | R.68-10 TDD |
| Channel bandwidth | MHz | 10 | 15 | 20 | 10 | 15 | 20 |
| Allocated resource blocks | PRB | Note 8 | Note 7 | Note 6 | Note 10 | Note 11 | Note 12 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | 4+2 | 4+2 | 4 | 4 | 4 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding Rate |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 0.82 | 0.82 | 0.80 | 0.70 | 0.70 | 0.70 |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 3 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 |  | 0.78 | 0.79 | 0.78 | 0.77 | 0.76 | 0.77 |
| For Sub-Frame 5 |  | 0.81 | 0.82 | 0.78 | 0.70 | 0.70 | 0.69 |
| For Sub-Frame 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 |  | 0.78 | 0.79 | 0.78 | 0.77 | 0.76 | 0.77 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 84760 | 128496 | 169544 | 110136 | 169544 | 236160 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 | Bits | 84760 | 128496 | 169544 | 133208 | 195816 | 266440 |
| For Sub-Frame 5 | Bits | 81176 | 124464 | 161760 | 101840 | 157432 | 220296 |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 | Bits | 84760 | 128496 | 169544 | 133208 | 195816 | 266440 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 14 | 21 | 28 | 18 | 28 | 39 |
| For Sub-Frame 1 |  | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frames 3 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 |  | 14 | 21 | 28 | 22 | 32 | 44 |
| For Sub-Frame 5 |  | 14 | 21 | 27 | 17 | 26 | 36 |
| For Sub-Frame 6 |  | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 |  | 14 | 21 | 28 | 22 | 32 | 44 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 103808 | 158208 | 212608 | 157440 | 241920 | 337920 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 | Bits | 108800 | 163200 | 217600 | 172800 | 259200 | 345600 |
| For Sub-Frame 5 |  | 101120 | 153344 | 207744 | 145920 | 226560 | 322560 |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 | Bits | 108800 | 163200 | 217600 | 172800 | 259200 | 345600 |
| Number of layers |  | 4 | 4 | 4 | 8 | 8 | 8 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 33.546 | 50.995 | 67.039 | 95.678 | 143.722 | 197.867 |
| UE Categories |  | 11-12 | 11-12 | 11-12 | 8 | 8 | 8 |
| UE DL Categories |  | 13-14 | 13-14 | 13-14 | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 | 14, 17,18,19,20,22,23,24,25,26 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword.  Note 6: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in other downlink sub-frames.  Note 7: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in other downlink sub-frames.  Note 8: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in the available downlink sub-frames according to uplink downlink configurations used.  Note 9: The first RBG, i.e. resource blocks nPRB = 0..2 for 10MHz channel bandwidth, nPRB = 0..3 for 15MHz and 20MHz channel bandwidths are allocated for SIB transmissions in sub-frame 5.  Note 10: 84 resource blocks nPRB = 4..43 and nPRB = 56..99 are allocated for the user data in sub-frame 5, and 88 resource blocks nPRB = 0..43 and nPRB = 56..99 are allocated for the user data in sub-frame 0,and 100 resource blocks nPRB = 0..99 in other downlink sub-frames.  Note 11: 59 resource blocks nPRB = 4..31 and nPRB = 44...74 are allocated for the user data in sub-frame 5, and 63 resource blocks nPRB = 0..31 and nPRB = 44..74 are allocated for the user data in sub-frame 0, and 75 resource blocks nPRB = 0..74 in other downlink sub-frames.  Note 12: 38 resource blocks nPRB = 3..20 and nPRB = 30..49 are allocated for the user data in sub-frame 5, and 41 resource blocks nPRB = 0..20 and nPRB = 30..49 are allocated for the user data in sub-frame 0, and 50 resource blocks nPRB = 0..49 in other available downlink sub-frames according to uplink downlink configurations used. | | | | | | | |

Table A.3.9.2-4: Fixed Reference Channel for sustained data-rate test (TDD 1024QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.105 TDD | R.105-1 TDD | R.105-2 TDD | R.105-3 TDD | R.105-4 TDD | R.105-5 TDD |
| Channel bandwidth | MHz | 20 | 15 | 10 | 20 | 15 | 10 |
| Allocated resource blocks | PRB | Note 6 | Note 7 | Note 8 | Note 6 | Note 7 | Note 8 |
| Uplink-Downlink Configuration (Note 3) |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Allocated subframes per Radio Frame (D+S) |  | 4+2 | 4+2 | 4+2 | 4+2 | 4+2 | 4+2 |
| Modulation |  | 1024QAM | 1024QAM | 1024QAM | 1024QAM | 1024QAM | 1024QAM |
| Target Coding Rate |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 0.78 | 0.78 | 0.80 | 0.83 | 0.82 | 0.85 |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 3 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 |  | 0.76 | 0.75 | 0.76 | 0.81 | 0.79 | 0.81 |
| For Sub-Frame 5 |  | 0.77 | 0.78 | 0.76 | 0.82 | 0.82 | 0.81 |
| For Sub-Frame 6 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 |  | 0.76 | 0.75 | 0.76 | 0.81 | 0.79 | 0.81 |
| Information Bit Payload |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 110136 | 81176 | 55056 | 220296 | 161760 | 110136 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 | Bits | 110136 | 81176 | 55056 | 220296 | 161760 | 110136 |
| For Sub-Frame 5 | Bits | 105528 | 78704 | 51024 | 211936 | 157432 | 101840 |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 | Bits | 110136 | 81176 | 55056 | 220296 | 161760 | 110136 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 18 | 14 | 9 | 36 | 27 | 18 |
| For Sub-Frame 1 |  | N/A | N/A | N/A | 0 | 0 | 0 |
| For Sub-Frames 3 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 |  | 18 | 14 | 9 | 36 | 27 | 18 |
| For Sub-Frame 5 |  | 18 | 13 | 9 | 35 | 26 | 17 |
| For Sub-Frame 6 |  | N/A | N/A | N/A | 0 | 0 | 0 |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 |  | 18 | 14 | 9 | 36 | 27 | 18 |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frame 0 | Bits | 140640 | 104640 | 68640 | 265760 | 197760 | 129760 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 4 | Bits | 144000 | 108000 | 72000 | 272000 | 204000 | 136000 |
| For Sub-Frame 5 |  | 137520 | 101520 | 66960 | 259680 | 191680 | 126400 |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 7 |  | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 9 | Bits | 144000 | 108000 | 72000 | 272000 | 204000 | 136000 |
| Number of layers |  | 2 | 2 | 2 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 43.5936 | 32.2232 | 20.928 | 87.2824 | 64.2712 | 43.2248 |
| UE DL Categories |  | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 | 20, ≥22 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Given per component carrier per codeword.  Note 6: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in other downlink sub-frames.  Note 7: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in other downlink sub-frames.  Note 8: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in the available downlink sub-frames according to uplink downlink configurations used. | | | | | | | |

### A.3.9.3 FDD (EPDCCH scheduling)

Table A.3.9.3-1: Fixed Reference Channel for sustained data-rate test with EPDCCH scheduling (FDD)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | R.31E-1 FDD | R.31E-2 FDD | R.31E-3 FDD | R.31E-3A FDD | R.31E-3C FDD | R.31E-4 FDD | R.31E-4B FDD | |
| Channel bandwidth | MHz | 10 | 10 | 20 | 10 | 15 | 20 | 15 | |
| Allocated resource blocks (Note 8) |  | Note 5 | Note 6 | Note 7 | Note 6 | Note 9 | Note 7 | Note 10 | |
| Allocated subframes per Radio Frame |  | 10 | 10 | 10 | 10 | 10 | 10 | 10 | |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | |
| Coding Rate  (subframes with PDCCH USS monitoring) |  |  |  |  |  |  |  |  | |
| For Sub-Frame 1,2,3,4,6,7,8,9, |  | 0.3972 | 0.5926 | 0.5933 | 0.8533 | 0.8725 | 0.8763 | 0.8533 | |
| For Sub-Frame 5 |  | 0.3972 | 0.6441 | 0.6246 | 0.8889 | 0.8855 | 0.8702 | 0.8762 | |
| For Sub-Frame 0 |  | 0.3972 | 0.6282 | 0.6106 | 0.9046 | 0.9105 | 0.9018 | 0.8868 | |
| Coding Rate  (subframes with EPDCCH USS monitoring) |  |  |  |  |  |  |  |  | |
| For Sub-Frame 1,2,3,4,6,7,8,9, |  | 0.4114 | 0.6047 | 0.5993 | 0.8707 | 0.8855 | 0.8851 | 0.8649 | |
| For Sub-Frame 5 |  | 0.4114 | 0.6584 | 0.6312 | 0.9086 | 0.8990 | 0.8794 | 0.8889 | |
| For Sub-Frame 0 |  | 0.4114 | 0.6418 | 0.6170 | 0.9242 | 0.9246 | 0.9112 | 0.8993 | |
| Information Bit Payload (Note 8) |  |  |  |  |  |  |  |  | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 | |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 35160 | 51024 | 71112 | 52752 | |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 | |
| Number of Code Blocks (Notes 3 and 8) |  |  |  |  |  |  |  |  | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 | |
| For Sub-Frame 5 | Bits | 2 | 5 | 9 | 6 | 9 | 12 | 9 | |
| For Sub-Frame 0 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 | |
| Binary Channel Bits (Note 8) (subframes with PDCCH USS monitoring) |  |  |  |  |  |  |  |  | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 26100 | 43200 | 86400 | 43200 | 58752 | 86400 | 64800 | |
| For Sub-Frame 5 | Bits | 26100 | 39744 | 82080 | 39744 | 57888 | 82080 | 60480 | |
| For Sub-Frame 0 | Bits | 26100 | 40752 | 83952 | 40752 | 56304 | 83952 | 62352 | |
| Binary Channel Bits (Note 8) (subframes with EPDCCH USS monitoring) |  |  |  |  |  |  |  |  | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 25200 | 42336 | 85536 | 42336 | 57888 | 85536 | 63936 | |
| For Sub-Frame 5 | Bits | 25200 | 38880 | 81216 | 38880 | 57024 | 81216 | 59616 | |
| For Sub-Frame 0 | Bits | 25200 | 39888 | 83088 | 39888 | 55440 | 83088 | 61488 | |
| Number of layers |  | 1 | 2 | 2 | 2 | 2 | 2 | 2 | |
| Max. Throughput averaged over 1 frame (Note 8) | Mbps | 10.296 | 25.456 | 51.024 | 36.542 | 51.024 | 74.950 | 54.826 | |
| UE Categories |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 | ≥ 3 | ≥ 4 | |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211.  Note 3: 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 4: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 5: Resource blocks nPRB = 6..14,30..49 are allocated for the user data in all sub-frames.  Note 6: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 7: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.  Note 8: Given per component carrier per codeword.  Note 9: Resource blocks nPRB = 4..71 are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.  Note 10: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9. | | | | | | | | |

### A.3.9.4 TDD (EPDCCH scheduling)

Table A.3.9.4-1: Fixed Reference Channel for sustained data-rate with EPDCCH scheduling (TDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | R.31E-1 TDD | R.31E-2 TDD | R.31E-3 TDD | R.31E-3A TDD | R.31E-4 TDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 15 | 20 |
| Allocated resource blocks |  | Note 6 | Note 7 | Note 8 | Note 9 | Note 8 |
| Uplink-Downlink Configuration (Note 3) |  | 5 | 5 | 5 | 1 | 1 |
| Number of HARQ Processes per component carrier | Processes | 15 | 15 | 15 | 7 | 7 |
| Allocated subframes per Radio Frame (D+S) |  | 8+1 | 8+1 | 8+1 | 4 | 4 |
| Coding Rate  (subframes with PDCCH USS monitoring) |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 0.3972 | 0.5926 | 0.5933 | 0.8725 | 0.8763 |
| For Sub-Frames 3,7,8 |  | 0.3972 | 0.5926 | 0.5933 | N/A | N/A |
| For Sub-Frames 1 |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 5 |  | 0.3972 | 0.6372 | 0.6213 | 0.8790 | 0.8656 |
| For Sub-Frames 6 |  | 0.3972 | 0.5986 | 0.5963 | N/A | N/A |
| For Sub-Frames 0 |  | 0.3972 | 0.6216 | 0.6075 | 0.9036 | 0.8972 |
| Coding Rate  (subframes with EPDCCH USS monitoring) |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 0.4114 | 0.6047 | 0.5993 | 0.8856 | 0.8851 |
| For Sub-Frames 3,7,8 |  | 0.4114 | 0.6047 | 0.5993 | N/A | N/A |
| For Sub-Frames 1 |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 5 |  | 0.4114 | 0.6512 | 0.6279 | 0.8922 | 0.8748 |
| For Sub-Frames 6 |  | 0.4114 | 0.6109 | 0.6024 | N/A | N/A |
| For Sub-Frames 0 |  | 0.4114 | 0.6349 | 0.6138 | 0.9175 | 0.9065 |
| Information Bit Payload |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 |
| For Sub-Frames 3,7,8 | Bits | 10296 | 25456 | 51024 | N/A | N/A |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | N/A | N/A |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 51024 | 71112 |
| For Sub-Frame 6 | Bits | 10296 | 25456 | 51024 | N/A | N/A |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 2 | 5 | 9 | 9 | 13 |
| For Sub-Frames 3,7,8 |  | 2 | 5 | 9 | N/A | N/A |
| For Sub-Frame 1 |  | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 |  | 2 | 5 | 9 | 9 | 12 |
| For Sub-Frame 6 | Bits | 2 | 5 | 9 | N/A | N/A |
| For Sub-Frame 0 |  | 2 | 5 | 9 | 9 | 13 |
| Binary Channel Bits per Sub-Frame (subframes with PDCCH USS monitoring) |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 26100 | 43200 | 86400 | 58752 | 86400 |
| For Sub-Frames 3,7,8 | Bits | 26100 | 43200 | 86400 | N/A | N/A |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | N/A | N/A |
| For Sub-Frame 5 | Bits | 26100 | 40176 | 82512 | 58320 | 82512 |
| For Sub-Frame 6 | Bits | 26100 | 42768 | 85968 | N/A | N/A |
| For Sub-Frame 0 | Bits | 26100 | 41184 | 84384 | 56736 | 84384 |
| Binary Channel Bits per Sub-Frame (subframes with EPDCCH USS monitoring) |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 25200 | 42336 | 85536 | 57888 | 85536 |
| For Sub-Frames 3,7,8 | Bits | 25200 | 42336 | 85536 | N/A | N/A |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | N/A | N/A |
| For Sub-Frame 5 | Bits | 25200 | 39312 | 81648 | 57456 | 81648 |
| For Sub-Frame 6 | Bits | 25200 | 41904 | 85104 | N/A | N/A |
| For Sub-Frame 0 | Bits | 25200 | 40320 | 83520 | 55872 | 83520 |
| Number of layers |  | 1 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 10) | Mbps | 8.237 | 20.365 | 40.819 | 20.409 | 29.724 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: As per Table 4.2-2 in TS 36.211 [4].  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: Resource blocks nPRB = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.  Note 6: Resource blocks nPRB = 6..14,30..49 are allocated for the user data in all subframes.  Note 7: Resource blocks nPRB = 3..49 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..49 in sub-frames 0,3,4,6,7,8,9.  Note 8: Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in sub-frames 0,3,4,6,7,8,9.  Note 9: Resource blocks nPRB = 4..71 are allocated for the user data in all sub-frames  Note10: Given per component carrier per codeword. | | | | | | |

### A.3.9.5 LAA

Table A.3.9.5-1: Fixed Reference Channel for sustained data-rate test (FS3 64QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.5 FS3 | R.6 FS3 | R.7 FS3 | R.8 FS3 | R.9 FS3 | R.10 FS3 |
| Channel bandwidth | MHz | 20 | 20 | 20 | 20 | 20 | 20 |
| Allocated resource blocks |  | 100 | 100 | 100 | 100 | 100 | 100 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Coding Rate |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 0.89 | 0.89 | 0.90 | 0.80 | 0.80 | 0.81 |
| For Sub-Frame 1,2,3,4,6,7,8 |  | 0.88 | 0.88 | 0.88 | 0.79 | 0.79 | 0.79 |
| For Sub-Frame 5 |  | 0.89 | 0.89 | 0.89 | 0.80 | 0.80 | 0.80 |
| For Sub-Frame 9 |  | N/A | 0.77 | 0.88 | N/A | 0.82 | 0.79 |
| Information Bit Payload (Note 7) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 75376 | 75376 | 36696 | 128496 | 128496 | 61664 |
| For Sub-Frames 1,2,3,4,6,7,8 | Bits | 75376 | 75376 | 75376 | 128496 | 128496 | 128496 |
| For Sub-Frame 5 | Bits | 75376 | 75376 | 75376 | 128496 | 128496 | 128496 |
| For Sub-Frame 9 | Bits | N/A | 55056 | 75376 | N/A | 110136 | 128496 |
| Number of Code Blocks (Notes 3 and 6) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 13 | 13 | 6 | 21 | 21 | 11 |
| For Sub-Frames 1,2,3,4,6,7,8 |  | 13 | 13 | 13 | 21 | 21 | 21 |
| For Sub-Frame 5 |  | 13 | 13 | 13 | 21 | 21 | 21 |
| For Sub-Frame 9 |  | N/A | 9 | 13 | N/A | 18 | 21 |
| Binary Channel Bits (Note 7) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 85536 | 85536 | 40800 | 161472 | 161472 | 76800 |
| For Sub-Frames 1,2,3,4,6,7,8 | Bits | 86400 | 86400 | 86400 | 163200 | 163200 | 163200 |
| For Sub-Frame 5 | Bits | 85536 | 85536 | 85536 | 161472 | 161472 | 161472 |
| For Sub-Frame 9 | Bits | N/A | 72000 | 86400 | N/A | 134400 | 163200 |
| Number of layers |  | 2 | 2 | 2 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 7) | Mbps | 67.8384 | 73.3440 | 71.5080 | 115.6464 | 126.6600 | 121.8128 |
| UE Categories |  | ≥ 5 | ≥ 5 | ≥ 5 | ≥ 5 | ≥ 5 | ≥ 5 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal and synchronization signals are allocated as per TS 36.211 [4]. PBCH and SIBs are not allocated in FS3 cell.  Note 3: 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 4: For R.5 FS3 and R.8 FS3, burst consists of 9 full subframes. Between two consecutive bursts, there is one subframe gap.  Note 5: For R.6 FS3 and R.9 FS3, burst consists of 9 full subframes and 1 ending partial subframe that has 12 OFDM symbols. Between two consecutive bursts, there is 2 OFDM symbol gap.  Note 6: For R.7 FS3 and R.10 FS3, burst consists of 1 initial partial subframe and 9 full subframes. Between two consecutive bursts, there is 7 OFDM symbol gap.  Note 7: Given per component carrier per codeword. | | | | | | | |

Table A.3.9.5-2: Fixed Reference Channel for sustained data-rate test (FS3 256QAM)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | **Value** | | | | | |
| Reference channel |  | R.11 FS3 | R.12 FS3 | R.13 FS3 | R.14 FS3 | R.15 FS3 | R.16 FS3 |
| Channel bandwidth | MHz | 20 | 20 | 20 | 20 | 20 | 20 |
| Allocated resource blocks |  | 100 | 100 | 100 | 100 | 100 | 100 |
| Modulation |  | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Coding Rate |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 0.75 | 0.75 | 0.81 | 0.79 | 0.79 | 0.77 |
| For Sub-Frame 3,4,8 |  | 0.85 | 0.85 | 0.85 | 0.78 | 0.78 | 0.78 |
| For Sub-Frame 1,2,6,7 |  | 0.75 | 0.74 | 0.74 | 0.78 | 0.78 | 0.78 |
| For Sub-Frame 5 |  | 0.75 | 0.75 | 0.75 | 0.79 | 0.79 | 0.79 |
| For Sub-Frame 9 |  | N/A | 0.79 | 0.85 | N/A | 0.74 | 0.78 |
| Information Bit Payload (Note 7) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 84760 | 84760 | 43816 | 169544 | 169544 | 78704 |
| For Sub-Frame 3,4,8 | Bits | 97896 | 97896 | 97896 | 169544 | 169544 | 169544 |
| For Sub-Frame 1,2,6,7 | Bits | 84760 | 84760 | 84760 | 169544 | 169544 | 169544 |
| For Sub-Frame 5 | Bits | 84760 | 84760 | 84760 | 169544 | 169544 | 169544 |
| For Sub-Frame 9 | Bits | N/A | 75376 | 97896 | N/A | 133208 | 169544 |
| Number of Code Blocks (Notes 3 and 6) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 14 | 14 | 8 | 28 | 28 | 13 |
| For Sub-Frame 3,4,8 |  | 16 | 16 | 16 | 28 | 28 | 28 |
| For Sub-Frame 1,2,6,7 |  | 14 | 14 | 14 | 28 | 28 | 28 |
| For Sub-Frame 5 |  | 14 | 14 | 14 | 28 | 28 | 28 |
| For Sub-Frame 9 |  | N/A | 13 | 16 | N/A | 21 | 28 |
| Binary Channel Bits (Note 7) |  |  |  |  |  |  |  |
| For Sub-Frame 0 |  | 114048 | 114048 | 54400 | 215296 | 215296 | 102400 |
| For Sub-Frame 3,4,8 | Bits | 115200 | 115200 | 115200 | 217600 | 217600 | 217600 |
| For Sub-Frame 1,2,6,7 | Bits | 115200 | 115200 | 115200 | 217600 | 217600 | 217600 |
| For Sub-Frame 5 | Bits | 114048 | 114048 | 114048 | 215296 | 215296 | 215296 |
| For Sub-Frame 9 | Bits | N/A | 96000 | 115200 | N/A | 179200 | 217600 |
| Number of layers |  | 2 | 2 | 2 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 7) | Mbps | 80.2248 | 87.7624 | 85.9200 | 152.5896 | 165.9104 | 160.4600 |
| UE DL Categories |  | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 |
| Note 1: 1 symbol allocated to PDCCH for all tests.  Note 2: Reference signal and synchronization signals are allocated as per TS 36.211 [4]. PBCH and SIBs are not allocated in FS3 cell.  Note 3: 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 4: For R.11 FS3 and R.14 FS3, burst consists of 9 full subframes. Between two consecutive bursts, there is one subframe gap.  Note 5: For R.12 FS3 and R.15 FS3, burst consists of 9 full subframes and 1 ending partial subframe that has 12 OFDM symbols. Between two consecutive bursts, there is 2 OFDM symbol gap.  Note 6: For R.13 FS3 and R.16 FS3, burst consists of 1 initial partial subframe and 9 full subframes. Between two consecutive bursts, there is 7 OFDM symbol gap.  Note 7: Given per component carrier per codeword. | | | | | | | |

## A.3.10 Reference Measurement Channels for EPDCCH performance requirements

### A.3.10.1 FDD

Table A.3.10.1-1: Reference Channel FDD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.55 FDD | R.56 FDD | R.57 FDD | R.58 FDD | R.59 FDD | R.55-1 FDD |
| Number of transmitter antennas |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 2 | 1 | 1 | 1 | 2 |
| Aggregation level | ECCE | 4 | 16 | 2 | 8 | 2 | 4 |
| DCI Format |  | 2A | 2A | 2C | 2C | 2D | 2C |

### A.3.10.2 TDD

Table A.3.10.2-1: Reference Channel TDD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | R.55 TDD | R.56 TDD | R.57 TDD | R.58 TDD | R.59 TDD | R.55 TDD |
| Number of transmitter antennas |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 2 | 1 | 1 | 1 | 2 |
| Aggregation level | CCE | 4 | 16 | 2 | 8 | 2 | 4 |
| DCI Format |  | 2A | 2A | 2C | 2C | 2D | 2C |

## A.3.11 Reference Measurement Channels for MPDCCH performance requirements

### A.3.11.1 FDD and half-duplex FDD

Table A.3.11.1-1: Reference Channel FDD and half-duplex FDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | Value | Value |
| Reference channel |  | R.82 FDD | R.83 FDD | R.96 FDD |
| Number of transmitter antennas |  | 2 | 2 | 2 |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| OFDM starting symbol (startSymbolLC) | symbols | 2 | 2 | 2 |
| Aggregation level | ECCE | 16 | 24 | 4 |
| DCI Format |  | 6-1A | 6-1B | 6-1A |
| Payload (without CRC) | Bits | 29 | 18 | 29 |
| PRB allocation |  | 8-th ~11-th PRB | As specified in Test | 8-th ~11-th PRB |

### A.3.11.2 TDD

Table A.3.11.2-1: Reference Channel TDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | Value | Value |
| Reference channel |  | R.82 TDD | R.83 TDD | R.96 TDD |
| Number of transmitter antennas |  | 2 | 2 | 2 |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| OFDM starting symbol (startSymbolLC) | symbols | 2 | 2 | 2 |
| Aggregation level | ECCE | 16 | 24 | 4 |
| DCI Format |  | 6-1A | 6-1B | 6-1A |
| Payload (without CRC) | Bits | 32 | 18 | 32 |
| PRB allocation |  | 8-th ~11-th PRB | As specified in Test | 8-th ~11-th PRB |

## A.3.12 Reference measurement channels for NPDSCH performance requirements

### A.3.12.1 In-band

#### A.3.12.1.2 Two-antenna transmission

Table A.3.12.1.2-1: NPDSCH Reference Channel with 2 TX Antennas for FDD

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Value** |
| Reference channel |  | R.NB.5 FDD | R.NB.5-1 FDD |
| Carrier Type |  | Anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 |
| Allocated subframes per Radio Frame |  | Note 2 | Note 2 |
| Modulation |  | QPSK | QPSK |
| ITBS/ISF |  | 4/0 | 4/0 |
| Target Coding Rate |  | 1/3 | 1/3 |
| Coding Rate |  | 0.4 | 0.4 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 56 | 56 |
| For Sub-Frame 0,5 | Bits | N/A | 56 |
| For Sub-Frame 4,9 | Bits | Note 3 | 56 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 |  | 1 | 1 |
| For Sub-Frame 0,5 | Bits | N/A | 1 |
| For Sub-Frame 4,9 | Bits | Note 4 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 200 | 200 |
| For Sub-Frame 0,5 | Bits | N/A | 200 |
| For Sub-Frame 4,9 | Bits | Note 5 | 200 |
| Max. Averaged Throughput | Bps | Note 6 | Note 6 |
| UE Category |  | NB1,NB2 | NB1,NB2 |
| Note 1: For in-band, the first 3 symbols are used for LTE PDCCH and the number of LTE CRS ports is 4.  Note 2: It shall depend on the specific NPDSCH scheduling.  Note 3: N/A when mod 2 = 0, otherwise 56.  Note 4: N/A when mod 2 = 0, otherwise 1.  Note 5: N/A when mod 2 = 0, otherwise 200.  Note 6: 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.3.12.1.2-2: NPDSCH Reference Channel with 2 TX Antennas for TDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Value |
| Reference channel |  | R.NB.5 TDD | R.NB.5-1 TDD |
| Carrier Type |  | Anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 |
| Uplink-Downlink Configuration (Note 7) |  | 4 | 4 |
| Allocated subframes per Radio Frame |  | Note 2 | Note 2 |
| Modulation |  | QPSK | QPSK |
| ITBS/ISF |  | 4/0 | 4/0 |
| Target Coding Rate |  | 1/3 | 1/3 |
| Coding Rate |  | 0.4 | 0.4 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 1,6,7,8 | Bits | 56 | 56 |
| For Sub-Frame 5 | Bits | N/A | Note 3 |
| For Sub-Frame 9 |  | N/A | 56 |
| For Sub-Frame 0 | Bits | Note 3 | Note 3 |
| For Sub-Frame 4 |  | Note 3 | 56 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 1,6,7,8 |  | 1 | 1 |
| For Sub-Frame 5 | Bits | N/A | Note 4 |
| For Sub-Frame 9 |  | N/A | 1 |
| For Sub-Frame 0 | Bits | Note 4 | Note 4 |
| For Sub-Frame 4 |  | Note 4 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 1,6,7,8 | Bits | 200 | 200 |
| For Sub-Frame 5 | Bits | N/A | Note 5 |
| For Sub-Frame 9 |  | N/A | 200 |
| For Sub-Frame 0 | Bits | Note 5 | Note 5 |
| For Sub-Frame 4 |  | Note 5 | 200 |
| Max. Averaged Throughput | Bps | Note 6 | Note 6 |
| UE Category |  | NB1,NB2 | NB1,NB2 |
| Note 1: For in-band, the first 3 symbols are used for LTE PDCCH and the number of LTE CRS ports is 4.  Note 2: It shall depend on the specific NPDSCH scheduling.  Note 3: N/A when mod 2 = 0, otherwise 56.  Note 4: N/A when mod 2 = 0, otherwise 1.  Note 5: N/A when mod 2 = 0, otherwise 200.  Note 6: 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.  Note 7: As per Table 4.2-2 in TS 36.211 [4]. | | | |

### A.3.12.2 Standalone/Guard-band

#### A.3.12.2.1 Single-antenna transmission

Table A.3.12.2.1-1: NPDSCH Reference Channel with 1Tx Antenna for UE Category NB1 and NB2 for FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Value |
| Reference channel |  | R.NB.6 FDD | R.NB.6-1 FDD |
| Carrier Type |  | Anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 |
| Allocated subframes per Radio Frame |  | Note 1 | Note 1 |
| Modulation |  | QPSK | QPSK |
| ITBS/ISF |  | 9/3 | 6/3 |
| Target Coding Rate |  | 1/2 | 1/3 |
| Coding Rate |  | 0.5 | 0.33 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 616 | 392 |
| For Sub-Frame 0,5 | Bits | N/A | 392 |
| For Sub-Frame 4,9 | Bits | Note 2 | 392 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 |  | 1 | 1 |
| For Sub-Frame 0,5 | Bits | N/A | 1 |
| For Sub-Frame 4,9 | Bits | Note 3 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 320 | 320 |
| For Sub-Frame 0,5 | Bits | N/A | 320 |
| For Sub-Frame 4,9 | Bits | Note 4 | 320 |
| Max. Average Throughput | Bps | Note 5 | Note 5 |
| UE Category |  | NB1,NB2 | NB1,NB2 |
| Note 1: It shall depend on the specific NPDSCH scheduling.  Note 2: N/A when mod 2 = 0, otherwise 616.  Note 3: N/A when mod 2 = 0, otherwise 1.  Note 4: N/A when mod 2 = 0, otherwise 320.  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. | | | |

Table A.3.12.2.1-1a: NPDSCH Reference Channel with 1Tx Antenna for UE Category NB1 and NB2 for TDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Value |
| Reference channel |  | R.NB.6 TDD | R.NB.6-1 TDD |
| Carrier Type |  | 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 | QPSK |
| ITBS/ISF |  | 9/3 | 6/3 |
| Target Coding Rate |  | 1/2 | 1/3 |
| Coding Rate |  | 0.5 | 0.33 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 1,6,7,8 | Bits | 616 | 392 |
| For Sub-Frame 5 | Bits | N/A | Note 3 |
| For Sub-Frame 9 |  | N/A | 392 |
| For Sub-Frame 0 | Bits | Note 2 | Note 3 |
| For Sub-Frame 4 |  | Note 2 | 392 |
| Number of Code Blocks |  |  |  |
| For Sub-Frames 1,6,7,8 |  | 1 | 1 |
| For Sub-Frame 5 | Bits | N/A | Note 4 |
| For Sub-Frame 9 |  | N/A | 1 |
| For Sub-Frame 0 | Bits | Note 4 | Note 4 |
| For Sub-Frame 4 |  | Note 4 | 1 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 1,6,7,8 | Bits | 320 | 320 |
| For Sub-Frame 5 | Bits | N/A | Note 5 |
| For Sub-Frame 9 |  | N/A | 320 |
| For Sub-Frame 0 | Bits | Note 5 | Note 5 |
| For Sub-Frame 4 |  | Note 5 | 320 |
| Max. Average Throughput | Bps | Note 6 | Note 6 |
| UE Category |  | NB1,NB2 | NB1,NB2 |
| Note 1: It shall depend on the specific NPDSCH scheduling.  Note 2: N/A when mod 2 = 0, otherwise 616.  Note 3: N/A when mod 2 = 0, otherwise 392.  Note 4: N/A when mod 2 = 0, otherwise 1.  Note 5: N/A when mod 2 = 0, otherwise 320.  Note 6: 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.  Note 7: As per Table 4.2-2 in TS 36.211 [4]. | | | |

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. | | | |

## A.3.13 Reference measurement channels for NPDCCH performance requirements

### A.3.13.1 Half-duplex FDD

Table A.3.13.1-1: NPDCCH Reference Channel for Category NB1 UE

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.NB.3 FDD | R.NB.4 FDD |
| Number of NRS ports |  | 1 | 2 |
| Channel bandwidth | MHz | 0.2 | 0.2 |
| Aggregation level | NCCE | 2 | 2 |
| DCI Format |  | N1 | N1 |
| Payload (without CRC) | Bits | 23 | 23 |

### A.3.13.2 TDD

Table A.3.13.2-1: NPDCCH Reference Channel for Category NB1 UE

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.NB.3 TDD | R.NB.4 TDD |
| Number of NRS ports |  | 1 | 2 |
| Channel bandwidth | MHz | 0.2 | 0.2 |
| Aggregation level | NCCE | 2 | 2 |
| DCI Format |  | N1 | N1 |
| Payload (without CRC) | Bits | 23 | 23 |

## A.3.14 Reference measurement channels for NPBCH performance requirements for Cat NB1 UEs

Table A.3.14-1: NPBCH Reference Channel for Category NB1 UE

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | R.NB.1 | R.NB.2 |
| Number of transmitter antennas |  | 1 | 2 |
| Channel bandwidth | KHz | 200 | 200 |
| Modulation |  | QPSK | QPSK |
| Target coding rate |  | 50/1600 | 50/1600 |
| Payload (without CRC) | Bits | 34 | 34 |

## A.3.15 Reference Measurement Channels for LAA SCell with frame structure Type-3

### A.3.15.1 Multi-antenna transmission (Common Reference Symbols)

#### A.3.15.1.1 Four antenna ports

Table A.3.15.1.1-2: Reference Channel with four CRS ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.1 FS3 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks (Note 4) |  | 100 |
| Allocated subframes per Radio Frame |  | 10 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | 0.6 |
| Information Bit Payload (Note 4) |  |  |
| For Sub-Frames 1,4,6,9 | Bits | {46888,15840,24496,37888,19848} |
| For Sub-Frames 2, 7 |  | {46888,15840,24496,37888,19848} |
| For Sub-Frames 3, 8 |  | {46888,15840,24496,37888,19848} |
| For Sub-Frame 5 | Bits | {46888,15840,24496,37888,19848} |
| For Sub-Frame 0 | Bits | {46888,15840,24496,37888,19848} |
| Number of Code Blocks |  |  |
| (Notes 3 and 4) |  |  |
| For Sub-Frames 1,4,6,,9 |  | {8,3,4,7,4} |
| For Sub-Frames 2,7 |  | {8,3,4,7,4} |
| For Sub-Frames 3, 8 |  | {8,3,4,7,4} |
| For Sub-Frame 5 |  | {8,3,4,7,4} |
| For Sub-Frame 0 |  | {8,3,4,7,4} |
| Binary Channel Bits (Note 4) |  |  |
| For Sub-Frames 1,4,6,9 | Bits | {76800,26400,43200,62400,33600} |
| For Sub-Frames 2, 7 |  | {76800,26400,43200,62400,33600} |
| For Sub-Frames 3, 8 |  | {76800,26400,43200,62400,33600} |
| For Sub-Frame 5 | Bits | {75936,26400,43200,61536,33600} |
| For Sub-Frame 0 (Note 5) | Bits | {75936,26400,43200,61536,33600} |
| UE Category |  | ≥ 5 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: For {a1,a2,a3,a4,a5}, a1, a2, a3, a4 and a5 stand for the setup when the number of OFDM sybmols is 14, 6, 9, 12, 7, respectively. | | |

### A.3.15.2 Reference Measurement Channel for UE-Specific Reference Symbols

#### A.3.15.2.1 Two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.15.2.1-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports for LAA SCell.

Table A.3.15.2.1-1: Reference Channel with two CRS ports

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.2 FS3 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks (Note 4) |  | 100 |
| Allocated subframes per Radio Frame |  | 10 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload (Note 4) |  |  |
| For Sub-Frames 1,4,6,9 | Bits | {22920,7480,12960,19080,10296} |
| For Sub-Frames 2, 7 |  | {22920,7480,12960,19080,10296} |
| For Sub-Frames 3, 8 |  | {22920,7480,12960,19080,10296} |
| For Sub-Frame 5 | Bits | {19848, 6712, 11448, 16992, 9144} |
| For Sub-Frame 0 | Bits | {19848, 6712, 11448, 16992, 9144} |
| Number of Code Blocks |  |  |
| (Notes 3 and 4) |  |  |
| For Sub-Frames 1,4,6,9 |  | {4,2,3,4,2} |
| For Sub-Frames 2,7 |  | {4,2,3,4,2} |
| For Sub-Frames 3, 8 |  | {4, 2, 3, 4, 2} |
| For Sub-Frame 5 |  | {4, 2, 2, 3, 2} |
| For Sub-Frame 0 |  | {4, 2, 2, 3, 2} |
| Binary Channel Bits (Note 4) |  |  |
| For Sub-Frames 1,4,6,9 | Bits | {48000,15200,25600,38400,20000} |
| For Sub-Frames 2, 7 |  | {47200,15200,25600,38400,20000} |
| For Sub-Frames 3, 8 |  | {46400,15200,25600,38400,20000} |
| For Sub-Frame 5 | Bits | {42240,13376,22528,33792,17600} |
| For Sub-Frame 0 (Note 5) (Note 6) | Bits | {42240,13376,22528,33792,17600} |
| UE Category |  | ≥ 5 |
| Note 1: 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.  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].  Note 3: 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 4: Given per component carrier per codeword.  Note 5: For TM9, 100 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 88 resource blocks (RB0-RB43,RB56-RB99) are allocated in subframe 0 and subframe 5  Note 6: For {a1,a2,a3,a4,a5}, a1, a2, a3, a4 and a5 stand for the setup when the number of OFDM sybmols is 14, 6, 9, 12, 7, respectively | | |

Table A.3.15-2: Void

## A.3.16 Reference measurement channels for Slot-PDSCH and Subslot-PDSCH performance requirements

### A.3.16.1 FDD

Table A.3.16.1-1: Fixed Reference Channel Slot-PDSCH (Cell-Specific Reference Signals)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit |  |
| Reference channel |  | R.sTTI.1 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Allocated subframes per Radio Frame |  | 8 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |
| Slot index 0 | Bits | 11448 |
| Slot index 1 | Bits | 14112 |
| For Sub-Frames 0,5 |  | N/A |
| Number of Code Blocks |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |
| Slot index 0 |  | 2 |
| Slot index 1 |  | 4 |
| For Sub-Frame 0,5 |  | N/A |
| Binary Channel Bits |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |
| Slot index 0 | Bits | 22400 |
| Slot index 1 | Bits | 28288 |
| For Sub-Frame 0,5 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 20.448 |
| UE Category |  | ≥2 |
| Note 1: For an information bit payload first transmitted at slot 0, any retransmission happens only on slot 0. For an information bit payload first transmitted at slot 1, any retransmission happens on only slot 1. | | |

Table A.3.16.1-2: Fixed Reference Channel Subslot-PDSCH (Cell-Specific Reference Signals)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit |  |
| Reference channel |  | R.sTTI.2 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Allocated subframes per Radio Frame |  | 8 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 0.45 |
| Information Bit Payload |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |
| Subslot index 1 | Bits | 5160 |
| Subslot index 2 | Bits | 3880 |
| Subslot index 3 | Bits | 2664 |
| Subslot index 4 | Bits | 3880 |
| Subslot index 5 | Bits | 5160 |
| For Sub-Frames 0,5 |  | N/A |
| Number of Code Blocks |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |
| Subslot index 1 |  | 1 |
| Subslot index 2 |  | 1 |
| Subslot index 3 |  | 1 |
| Subslot index 4 |  | 1 |
| Subslot index 5 |  | 1 |
| For Sub-Frame 0,5 |  | N/A |
| Binary Channel Bits |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  |  |
| Subslot index 1 | Bits | 12032 |
| Subslot index 2 | Bits | 8832 |
| Subslot index 3 | Bits | 5888 |
| Subslot index 4 | Bits | 8832 |
| Subslot index 5 | Bits | 12288 |
| For Sub-Frame 0,5 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 16.5952 |
| UE Category |  | ≥2 |
| Note 1: For an information bit payload first transmitted at subslot 1, any retransmission happens only on subslots 1 and 5. For an information bit payload first transmitted at subslot 2, any retransmission happens only on subslots 2 and 4. For an information bit payload first transmitted at subslot 3, any retransmission happens only on subslot 3. For an information bit payload first transmitted at subslot 4, any retransmission happens only on subslots 2 and 4. For an information bit payload first transmitted at subslot 5, any retransmission happens only on subslots 1 and 5. | | |

Table A.3.16.1-3: Fixed Reference Channel Slot-PDSCH (User-Specific Reference Signals)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit |  |
| Reference channel |  | R.sTTI.3 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Allocated subframes per Radio Frame |  | 8 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Information Bit Payload |  |  |
| For Sub-Frames 1,3,4,6,8,9 |  |  |
| Slot index 0 | Bits | 3624 |
| Slot index 1 | Bits | 4392 |
| For Sub-Frames 2,7 |  |  |
| Slot index 0 | Bits | 2856 |
| Slot index 1 | Bits | 4392 |
| For Sub-Frames 0,5 |  | N/A |
| Number of Code Blocks |  |  |
| For Sub-Frames 1,3,4,6,8,9 |  |  |
| Slot index 0 |  | 1 |
| Slot index 1 |  | 1 |
| For Sub-Frames 2,7 |  |  |
| Slot index 0 |  | 1 |
| Slot index 1 |  | 1 |
| For Sub-Frame 0,5 |  | N/A |
| Binary Channel Bits |  |  |
| For Sub-Frames 1,3,4,6,8,9 |  |  |
| Slot index 0 | Bits | 10000 |
| Slot index 1 | Bits | 13360 |
| For Sub-Frames 2,7 |  |  |
| Slot index 0 | Bits | 9600 |
| Slot index 1 | Bits | 13360 |
| For Sub-Frame 0,5 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 6.2592 |
| UE Category |  | ≥2 |
| Note 1: For an information bit payload first transmitted at slot 0, any retransmission happens only on slot 0. For an information bit payload first transmitted at slot 1, any retransmission happens only on slot 1. | | |

Table A.3.16.1-4: Fixed Reference Channel Subslot-PDSCH (User-Specific Reference Signals)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit |  |
| Reference channel |  | R.sTTI.4 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Allocated subframes per Radio Frame |  | 8 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Information Bit Payload |  |  |
| For Sub-Frames 1,3,4,6,8,9 |  |  |
| Subslot index 1 | Bits | 1736 |
| Subslot index 2 | Bits | 1192 |
| Subslot index 3 | Bits | 776 |
| Subslot index 4 | Bits | 1192 |
| Subslot index 5 | Bits | 1736 |
| For Sub-Frames 2,7 |  |  |
| Subslot index 1 | Bits | 1736 |
| Subslot index 2 | Bits | 1192 |
| Subslot index 3 | Bits | 776 |
| Subslot index 4 | Bits | 1192 |
| Subslot index 5 | Bits | 1736 |
| For Sub-Frames 0,5 |  | N/A |
| Number of Code Blocks |  |  |
| For Sub-Frames 1,3,4,6,8,9 |  |  |
| Subslot index 1 |  | 1 |
| Subslot index 2 |  | 1 |
| Subslot index 3 |  | 1 |
| Subslot index 4 |  | 1 |
| Subslot index 5 |  | 1 |
| For Sub-Frames 2,7 |  |  |
| Subslot index 1 |  | 1 |
| Subslot index 2 |  | 1 |
| Subslot index 3 |  | 1 |
| Subslot index 4 |  | 1 |
| Subslot index 5 |  | 1 |
| For Sub-Frame 0,5 |  | N/A |
| Binary Channel Bits |  |  |
| For Sub-Frames 1,3,4,6,8,9 |  |  |
| Subslot index 1 | Bits | 4960 |
| Subslot index 2 | Bits | 4032 |
| Subslot index 3 | Bits | 2688 |
| Subslot index 4 | Bits | 4032 |
| Subslot index 5 | Bits | 5088 |
| For Sub-Frames 2,7 |  |  |
| Subslot index 1 | Bits | 4960 |
| Subslot index 2 | Bits | 3696 |
| Subslot index 3 | Bits | 2688 |
| Subslot index 4 | Bits | 4032 |
| Subslot index 5 | Bits | 5088 |
| For Sub-Frame 0,5 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 5.3056 |
| UE Category |  | ≥2 |
| Note 1: For an information bit payload first transmitted at subslot 1, any retransmission happens only on subslots 1 and 5. For an information bit payload first transmitted at subslot 2, any retransmission happens only on subslots 2 and 4. For an information bit payload first transmitted at subslot 3, any retransmission happens only on subslot 3. For an information bit payload first transmitted at subslot 4, any retransmission happens only on subslots 2 and 4. For an information bit payload first transmitted at subslot 5, any retransmission happens only on subslots 1 and 5.  Note 2: In any retransmission, no information bit payloads are scheduled at subslot #n when information bit payloads are not scheduled at subslot #(n-1). | | |

### A.3.16.2 TDD

Table A.3.16.2-1: Fixed Reference Channel Slot-PDSCH (Cell-Specific Reference Signals)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit |  |
| Reference channel |  | R.sTTI.1 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Uplink-Downlink Configurtion |  | 1 |
| Allocated subframes per Radio Frame (D) |  | 2 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 |  |  |
| Slot index 0 | Bits | 11448 |
| Slot index 1 | Bits | 14112 |
| For Sub-Frames 0,1,5,6 |  | N/A |
| Number of Code Blocks |  |  |
| For Sub-Frames 4,9 |  |  |
| Slot index 0 |  | 2 |
| Slot index 1 |  | 4 |
| For Sub-Frames 0,1,5,6 |  | N/A |
| Binary Channel Bits |  |  |
| For Sub-Frames 4,9 |  |  |
| Slot index 0 | Bits | 22400 |
| Slot index 1 | Bits | 28288 |
| For Sub-Frame 0,1,5,6 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 5.112 |
| UE Category |  | ≥2 |
| Note 1: For an information bit payload first transmitted at slot 0, any retransmission happens only on slot 0. For an information bit payload first transmitted at slot 1, any retransmission happens only on slot 1. | | |

Table A.3.16.2-2: Fixed Reference Channel Slot-PDSCH (User-Specific Reference Signals)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit |  |
| Reference channel |  | R.sTTI.2 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 |
| Uplink-Downlink Configurtion |  | 1 |
| Allocated subframes per Radio Frame (D) |  | 2 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 |  |  |
| Slot index 0 | Bits | 2856 |
| Slot index 1 | Bits | 4392 |
| For Sub-Frames 0,1,5,6 |  | N/A |
| Number of Code Blocks |  |  |
| For Sub-Frames 4,9 |  |  |
| Slot index 0 |  | 1 |
| Slot index 1 |  | 1 |
| For Sub-Frames 0,1,5,9 |  | N/A |
| Binary Channel Bits |  |  |
| For Sub-Frames 4,9 |  |  |
| Slot index 0 | Bits | 9600 |
| Slot index 1 | Bits | 13360 |
| For Sub-Frame 0,1,5,6 |  | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 1.4496 |
| UE Category |  | ≥2 |
| Note 1: For an information bit payload first transmitted at slot 0, any retransmission happens only on slot 0. For an information bit payload first transmitted at slot 1, any retransmission happens only on slot 1. | | |

## A.3.17 Reference measurement channels for SPDCCH performance requirements

### A.3.17.1 FDD

Table A.3.17.1-1: Reference Channel FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit |  |  |
| Reference channel |  | R.sTTI.10 FDD | R.sTTI.11 FDD |
| Number of transmitter antennas |  | 4 | 2 |
| Channel bandwidth | MHz | 10 | 10 |
| Aggregation level | SCCE | 2 | 8 |
| DCI Format |  | 7-1C | 7-1F |
| Cell ID |  | 0 | 0 |
| Payload (without CRC) | Bits | 32 | 28 |

### A.3.17.2 TDD

Table A.3.17.2-1: Reference Channel TDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit |  |  |
| Reference channel |  | R.sTTI.10 TDD | R.sTTI.11 TDD |
| Number of transmitter antennas |  | 4 | 2 |
| Channel bandwidth | MHz | 10 | 10 |
| Aggregation level | SCCE | 2 | 8 |
| DCI Format |  | 7-1C | 7-1F |
| Cell ID |  | 0 | 0 |
| Payload (without CRC) | Bits | 34 | 30 |

# 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) | | | | | | | | | | | | | | | | | | | |

# A.5 OFDMA Channel Noise Generator (OCNG)

## A.5.1 OCNG Patterns for FDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test) and/or allocations used for MBSFN. The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG\_RA and OCNG\_RB which together with a relative power level () specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:



where  denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG\_RA, OCNG\_RB, and the set of relative power levels are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a constant transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH\_RA/RB and PHICH\_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

For the performance requirements of UE with the CA capability, the OCNG patterns apply for each CC.

### A.5.1.1 OCNG FDD pattern 1: One sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

Table A.5.1.1-1: OP.1 FDD: One sided dynamic OCNG FDD Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | |

### A.5.1.2 OCNG FDD pattern 2: Two sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB .

Table A.5.1.2-1: OP.2 FDD: Two sided dynamic OCNG FDD Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| 0 – (First allocated PRB-1)  and  (Last allocated PRB+1) – () | 0 – (First allocated PRB-1)  and  (Last allocated PRB+1) – () | 0 – (First allocated PRB-1)  and  (Last allocated PRB+1) – () |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | |

### A.5.1.3 OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Allocation | Relative power level  [dB] | | | | PDSCH Data | PMCH Data |
| Subframe | | | |
| 0 | 5 | 4, 9 | 1 – 3, 6 – 8 |
| 1 – 49 | 0 | 0 (Allocation: all empty PRB-s) | 0 | N/A | Note 1 | N/A |
| 0 – 49 | N/A | N/A | N/A | 0 | N/A | Note 2 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameteris used to scale the power of PMCH.  Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  N/A: Not Applicable | | | | | | |

### A.5.1.3A OCNG FDD pattern 3A: 49 RB OCNG allocation with MBSFN enhancement in 10 MHz

Table A.5.1.3A-1: OP.3A FDD: OCNG FDD Pattern 3A

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Allocation | Relative power level  [dB] | | | PDSCH Data | PMCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| 1 – 49 | 0 | 0 (Allocation: all empty PRB-s) | N/A | Note 1 | N/A |
| 0 – 49 | N/A | N/A | 0 | N/A | Note 2 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated and transmitted using 1.25kHz numerology. PMCH subframes shall not contain any cell-specific Reference Signals. The parameteris used to scale the power of PMCH.  Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  N/A: Not Applicable | | | | | |

### A.5.1.4 OCNG FDD pattern 4: One sided dynamic OCNG FDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.1.4-1: OP.4 FDD: One sided dynamic OCNG FDD Pattern for MBMS transmission

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Allocation | Relative power level  [dB] | | | PDSCH Data | PMCH Data |
| Subframe | | |
| 0, 4, 9 | 5 | 1 – 3, 6 – 8 |
| First unallocated PRB – Last unallocated PRB | 0 | 0 (Allocation: all empty PRB-s) | N/A | Note 1 | N/A |
| First unallocated PRB – Last unallocated PRB | N/A | N/A | N/A | N/A | Note 2 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameteris used to scale the power of PMCH.  Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  N/A: Not Applicable | | | | | |

### A.5.1.4A OCNG FDD pattern 4A: One sided dynamic OCNG FDD pattern for enhanced MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.1.4A-1: OP.4A FDD: One sided dynamic OCNG FDD Pattern for MBMS transmission

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Allocation | Relative power level  [dB] | | | PDSCH Data | PMCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| First unallocated PRB – Last unallocated PRB | 0 | 0 (Allocation: all empty PRB-s) | N/A | Note 1 | N/A |
| First unallocated PRB – Last unallocated PRB | N/A | N/A | N/A | N/A | Note 2 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall not contain any cell-specific Reference Signals. The parameteris used to scale the power of PMCH.  Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  N/A: Not Applicable | | | | | |

### A.5.1.5 OCNG FDD pattern 5: One sided dynamic 16QAM modulated OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of DL sub-frames, when the unallocated area is continuous in the frequency domain (one sided).

Table A.5.1.5-1: OP.5 FDD: One sided dynamic 16QAM modulated OCNG FDD Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 3 (Large Delay CDD). The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | |

### A.5.1.6 OCNG FDD pattern 6: dynamic OCNG FDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB .

Table A.5.1.6-1: OP.6 FDD: OCNG FDD Pattern when user data is in 2 non-contiguous blocks

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | |

A.5.1.7 OCNG FDD pattern 7: dynamic OCNG FDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in multiple parts by the *M* allocated blocks for data transmission). The *m*-th allocated block starts with RPB  and ends with PRB , where *m* = 1, …, *M*. The system bandwidth starts with RPB 0 and ends with.

Table A.5.1.7-1: OP.7 FDD: OCNG FDD Pattern when user data is in multiple non-contiguous blocks

|  |  |  |  |
| --- | --- | --- | --- |
| **Relative power level  [dB]** | | | **PDSCH Data** |
| **Subframe** | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| **Allocation** | | |
| 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) | 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) | 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | |

### A.5.1.8 OCNG FDD pattern 8: Dynamic OCNG FDD pattern for TM10 transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain where there are *M* unallocated PRB blocks labled from 1-st block to *M*-th block (*M*>1) and the *m*-th block starts with PRB and end with PRB , or when the unallocated area is continuous in frequency domain where *M* =1 (one sided). The system bandwidth starts with RPB 0 and ends with. should be equal to or less than .

Table A.5.1.8-1: OP.8 FDD: Dynamic OCNG FDD Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| 1-st unallocated PRB (PRB~ PRB)  …  *m*-th unallocated PRB (PRB~ PRB)  …  *M*-th unallocated PRB (PRB~ PRB) | 1-st unallocated PRB (PRB~ PRB)  …  *m*-th unallocated PRB (PRB~ PRB)  …  *M*-th unallocated PRB (PRB~ PRB) | 1-st unallocated PRB (PRB~ PRB)  …  *m*-th unallocated PRB (PRB~ PRB)  …  *M*-th unallocated PRB (PRB~ PRB) |
| 0 | 0 | 0 | Note 1,2,3 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameteris used to scale the power of PDSCH.  Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The the transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  Note 3: The detailed test set-up for TM10 transmission i.e PMI configuration is specified to each test case. | | | |

## A.5.2 OCNG Patterns for TDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG\_RA and OCNG\_RB which together with a relative power level () specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:



where  denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG\_RA, OCNG\_RB, and the set of relative power levels are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH\_RA/RB and PHICH\_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

### A.5.2.1 OCNG TDD pattern 1: One sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.1-1: OP.1 TDD: One sided dynamic OCNG TDD Pattern

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Relative power level  [dB] | | | | PDSCH Data |
| Subframe (only if available for DL) | | | |
| 0 | 5 | 3, 4, 7, 8, 9 and 6 (as normal subframe) Note 2 | 1  and 6 (as special subframe) Note 2 |
| Allocation | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB |
| 0 | 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211  Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | | |

### A.5.2.2 OCNG TDD pattern 2: Two sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB .

Table A.5.2.2-1: OP.2 TDD: Two sided dynamic OCNG TDD Pattern

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Relative power level  [dB] | | | | PDSCH Data |
| Subframe (only if available for DL) | | | |
| 0 | 5 | 3, 4, 6, 7, 8, 9   (6 as normal subframe) Note 2 | 1,6  (6 as special subframe) Note 2 |
| Allocation | | | |
| 0 –  (First allocated PRB-1)  and (Last allocated PRB+1) – () | 0 –  (First allocated PRB-1)  and (Last allocated PRB+1) – () | 0 –  (First allocated PRB-1)  and (Last allocated PRB+1) – () | 0 –  (First allocated PRB-1)  and (Last allocated PRB+1) – () |
| 0 | 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211  Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | | |

### A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.2.3-1: OP.3 TDD: OCNG TDD Pattern 3 for 5ms downlink-to-uplink switch-point periodicity

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Allocation | Relative power level  [dB] | | | | PDSCH Data | PMCH Data |
| Subframe | | | |
| 0 | 5 | 4, 9Note 2 | 1, 6 |
| 1 – 49 | 0 | 0  (Allocation: all empty PRB-s) | N/A | 0 | Note 1 | N/A |
| 0 – 49 | N/A | N/A | 0 | N/A | N/A | Note 3 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.  Note 3: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals.  Note 4: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  N/A Not Applicable | | | | | | |

### A.5.2.4 OCNG TDD pattern 4: One sided dynamic OCNG TDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.2.4-1: OP.4 TDD: One sided dynamic OCNG TDD Pattern for MBMS transmission

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Allocation | Relative power level  [dB] | | | | PDSCH Data | PMCH Data |
| Subframe (only for DL) | | | |
| 0 and 6 (as normal subframe) | 1 (as special subframe) | 5 | 3, 4, 7 – 9 |
| First unallocated PRB – Last unallocated PRB | 0 | 0  (Allocation: all empty PRB-s of DwPTS) | 0  (Allocation: all empty PRB-s) | N/A | Note 1 | N/A |
| First unallocated PRB – Last unallocated PRB | N/A | N/A | N/A | N/A | N/A | Note2 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals.  Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  N/A Not Applicable | | | | | | |

### A.5.2.5 OCNG TDD pattern 5: One sided dynamic 16QAM modulated OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the sub-frames available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.5-1: OP.5 TDD: One sided dynamic 16QAM modulated OCNG TDD Pattern

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Relative power level  [dB] | | | | PDSCH Data |
| Subframe (only if available for DL) | | | |
| 0 | 5 | 3, 4, 7, 8, 9 and 6 (as normal subframe) Note 2 | 1  and 6 (as special subframe) Note 2 |
| Allocation | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB |
| 0 | 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameteris used to scale the power of PDSCH.  Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211  Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 3 (Large Delay CDD). The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | | |

### A.5.2.6 OCNG TDD pattern 6: dynamic OCNG TDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB .

Table A.5.2.6-1: OP.6 TDD: OCNG TDD Pattern when user data is in 2 non-contiguous blocks

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Relative power level  [dB] | | | | PDSCH Data |
| Subframe (only if available for DL) | | | |
| 0 | 5 | 3, 4, 6, 7, 8, 9   (6 as normal subframe) Note 2 | 1,6  (6 as special subframe) Note 2 |
| Allocation | | | |
| 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1)  and  (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) |
| 0 | 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211  Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | | |

A.5.2.7 OCNG TDD pattern 7: dynamic OCNG TDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in multiple parts by the *M* allocated blocks for data transmission). The *m*-th allocated block starts with RPB  and ends with PRB , where *m* = 1, …, *M*. The system bandwidth starts with RPB 0 and ends with.

Table A.5.2.7-1: OP.7 TDD: OCNG TDD Pattern when user data is in multiple non-contiguous blocks

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Relative power level  [dB]** | | | | **PDSCH Data** |
| **Subframe (only if available for DL)** | | | |
| 0 | 5 | 3, 4, 6, 7, 8, 9   (6 as normal subframe) Note 2 | 1,6  (6 as special subframe) Note 2 |
| **Allocation** | | | |
| 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) | 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) | 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) | 0 – (PRB)  … (PRB) – (PRB ) … (PRB) – (PRB ) |
| 0 | 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211  Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. | | | | |

### A.5.2.8 OCNG TDD pattern 8: Dynamic OCNG TDD pattern for TM10 transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain where there are *M* unallocated PRB blocks labled from 1-st block to *M*-th block (*M*>1) and the *m*-th block starts with PRB and end with PRB , or when the unallocated area is continuous in frequency domain where *M* =1 (one sided). The system bandwidth starts with RPB 0 and ends with. should be equal to or less than .

Table A.5.2.8-1: OP.8 TDD: Dynamic OCNG TDD Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| 1-st unallocated PRB (PRB~ PRB)  …  *m*-th unallocated PRB (PRB~ PRB)  …  *M*-th unallocated PRB (PRB~ PRB) | 1-st unallocated PRB (PRB~ PRB)  …  *m*-th unallocated PRB (PRB~ PRB)  …  *M*-th unallocated PRB (PRB~ PRB) | 1-st unallocated PRB (PRB~ PRB)  …  *m*-th unallocated PRB (PRB~ PRB)  …  *M*-th unallocated PRB (PRB~ PRB) |
| 0 | 0 | 0 | Note 1,2,3 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameteris used to scale the power of PDSCH.  Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The the transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  Note 3: The detailed test set-up for TM10 transmission i.e PMI configuration is specified to each test case. | | | |

## A.5.3 OCNG Patterns for Narrowband IoT

The following OCNG patterns are used for modelling allocations to virtual narrowband IoT UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG\_RA and OCNG\_RB which together with a relative power level () specifies the NPDSCH EPRE-to-NRS EPRE ratios in OFDM symbols with and without Narrowband reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:



where  denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG\_RA, OCNG\_RB, and the set of relative power levels are chosen such that when also taking allocations to the UE under test into account, as given by a NPDSCH or NPDCCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

### A.5.3.1 Narrowband IoT OCNG pattern 1

Table A.5.3.1-1: NB.OP.1 FDD: OCNG FDD Pattern 1

|  |  |  |
| --- | --- | --- |
| Bandwidth | Relative power level  [dB] | NPDCCH and corresponding NPDSCH  Data |
| Subframe |
| Unused subframes |
| 200KHz | 0 | Note 2 |
| Note 1: These subframes are assigned to an arbitrary number of virtual UEs with one NPDSCH per virtual UE with corresponding NPDCCH; the data transmitted over the OCNG NPDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of NPDSCH and NPDCCH.  Note 2: Subframes and/or REs available for narrowband IOT DL transmission depend on the in-band, guard band or standalone mode indicated in MIB, and scheduling delay between NPDCCH, NPDSCH, NPUSCH format 2 and NPDCCH specified in test cases.  Note 3: If two or more transmit antennas with NRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with NRS according to transmit diversity scheme. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with NRS used in the test. | | |

## A.5.4 OCNG Patterns for frame structure type 3

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG\_RA and OCNG\_RB which together with a relative power level () specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:



where  denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG\_RA, OCNG\_RB, and the set of relative power levels are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a constant transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PDCCH reference channel which specifies the control region. For any aggregationthe PDCCH are padded with resource element groups with a power level given respectively by PDCCH\_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

For the performance requirements of UE with the CA capability, the OCNG patterns apply for eachLAA Scell.

### A.5.4.1 OCNG FS3 pattern 1: One sided dynamic OCNG frame structure type 3 pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

Table A.5.4.1-1: OP.1 FS3: One sided dynamic OCNG frame structure type 3 Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  Note 3: Subframes available for DL transmission and Occupied OFDM symbols in each subframe depend on the downlink burst transmission pattern and its corresponding configuration | | | |

### A.5.4.2 OCNG FS3 pattern 2: Two sided dynamic OCNG frame structure 3 pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB .

Table A.5.4.2-1: OP.2 FS3: Two sided dynamic OCNG frame structure type 3 Pattern

|  |  |  |  |
| --- | --- | --- | --- |
| Relative power level  [dB] | | | PDSCH Data |
| Subframe | | |
| 0 | 5 | 1 – 4, 6 – 9 |
| Allocation | | |
| 0 – (First allocated PRB-1)  and  (Last allocated PRB+1) – () | 0 – (First allocated PRB-1)  and  (Last allocated PRB+1) – () | 0 – (First allocated PRB-1)  and  (Last allocated PRB+1) – () |
| 0 | 0 | 0 | Note 1 |
| Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameteris used to scale the power of PDSCH.  Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.  Note 3： Subframes available for DL transmission and Occupied OFDM symbols in each subframe depend on the downlink burst transmission pattern and its corresponding configuration. | | | |

# A.6 Sidelink reference measurement channels

## A.6.1 General

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 section 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 section 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.

### A.6.1.1 Overview of ProSe reference measurement channels

In Table A.6.1.1-1 are listed the ProSe reference measurement channels specified in annexes A.6.2 to A.6.6 of this release of TS 36.101. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation’s parameters as to be used for requirements are annexes A.6.2 to A.6.6 as appropriate.

Table A.6.1.1-1: Overview of ProSe reference measurement channels

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table | Name | BW | Mod | RB | UE Categ | Notes |
| Table A.6.2-1 | - | 5 | QPSK | 2 | ≥ 1 |  |
| Table A.6.2-1 | - | 10 | QPSK | 2 | ≥ 1 |  |
| Table A.6.2-1 | - | 15 | QPSK | 2 | ≥ 1 |  |
| Table A.6.2-1 | - | 20 | QPSK | 2 | ≥ 1 |  |
| Table A.6.2-2 | - | 5 | QPSK | 25 | ≥ 1 |  |
| Table A.6.2-2 | - | 10 | QPSK | 50 | ≥ 1 |  |
| Table A.6.2-3 | - | 5 | 16QAM | 25 | 2-8 |  |
| Table A.6.2-3 | - | 10 | 16QAM | 50 | 2-8 |  |
| Table A.6.2-4 | - | 5 | 16QAM | 25 | 1 |  |
| Table A.6.2-4 | - | 10 | 16QAM | 50 | 1 |  |
| Table A.6.3-1 | D.1 FDD / D.1 TDD | 5 | QPSK | 2 | ≥ 1 |  |
| Table A.6.3-1 | D.1 FDD / D.1 TDD | 10 | QPSK | 2 | ≥ 1 |  |
| Table A.6.3-1 | D.1 FDD / D.1 TDD | 15 | QPSK | 2 | ≥ 1 |  |
| Table A.6.3-1 | D.1 FDD / D.1 TDD | 20 | QPSK | 2 | ≥ 1 |  |
| Table A.6.4-1 | CC.1 FDD | 5 | QPSK | 1 | - |  |
| Table A.6.4-1 | CC.2 FDD | 10 | QPSK | 1 | - |  |
| Table A.6.4-1 | CC.3 FDD | 5 | QPSK | 1 | - |  |
| Table A.6.4-1 | CC.4 FDD | 10 | QPSK | 1 | - |  |
| Table A.6.4-1 | CC.5 FDD | 5 | QPSK | 1 | - |  |
| Table A.6.4-1 | CC.6 FDD | 10 | QPSK | 1 | - |  |
| Table A.6.5-1 | CD.1 FDD | 5/10 | QPSK | 10 | - |  |
| Table A.6.5-1 | CD.2 FDD | 5/10 | 16QAM | 10 | - |  |
| Table A.6.5-1 | CD.3 FDD | 5 | 16QAM | 25 | - |  |
| Table A.6.5-1 | CD.4 FDD | 10 | 16QAM | 50 | - |  |
| Table A.6.5-1 | CD.5 FDD | 5/10 | QPSK | 2 | - |  |
| Table A.6.5-2 | CD.6 FDD | 5 | 16QAM | 25 | - |  |
| Table A.6.5-2 | CD.7 FDD | 10 | 16QAM | 50 | - |  |
| Table A.6.6-1 | CP.1 FDD | 5/10 | QPSK | 6 | - |  |

## A.6.2 Reference measurement channel for receiver characteristics

For ProSe Direct Discovery, Table A.6.2-1 is applicable for measurements on the Receiver Characteristics (clause 7) including the requirements of subclause 7.4D (Maximum input level).

For ProSe Direct Communication, Table A.6.2-2 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4D (Maximum input level). Tables A.6.2-3, A.6.2-4, are applicable for subclause 7.4D (Maximum input level).

Table A.6.2-1: Fixed Reference measurement channel for ProSe Direct Discovery receiver requirements and maximum input level

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 2 | 2 | 2 | 2 |
| Subcarriers per resource block |  |  |  | 12 | 12 | 12 | 12 |
| Allocated subframes per Discovery period |  |  |  | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per subframe (see note) |  |  |  | 11 | 11 | 11 | 11 |
| Modulation |  |  |  | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size |  |  |  | 232 | 232 | 232 | 232 |
| Transport block CRC | Bits |  |  | 24 | 24 | 24 | 24 |
| Maximum number of HARQ transmissions |  |  |  | 1 | 1 | 1 | 1 |
| Binary Channel Bits (see note) | Bits |  |  | 528 | 528 | 528 | 528 |
| Max. Throughput averaged over 1 Discovery period of 320ms | kbps |  |  | 0.725 | 0.725 | 0.725 | 0.725 |
| UE Category |  |  |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note1: PSDCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  NOTE2: Throughput is 232 bits per Discovey period. The discovery period is configured as 320ms in the test. | | | | | | | |

Table A.6.2-2: Fixed Reference measurement channel for ProSe Direct Communication receiver requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Subcarriers per resource block |  |  |  | 12 | 12 |  |  |
| Packets per SA period |  |  |  | 1 | 1 |  |  |
| Modulation |  |  |  | QPSK | QPSK |  |  |
| Transport Block Size |  |  |  | 2216 | 4392 |  |  |
| Transport block CRC | Bits |  |  | 24 | 24 |  |  |
| Maximum number of HARQ transmissions |  |  |  | 4 | 4 |  |  |
| Binary Channel Bits | Bits |  |  | 7200 | 14400 |  |  |
| Max. Throughput averaged over 1 SA period of 40ms | kbps |  |  | 55.4 | 109.8 |  |  |
| UE Category |  |  |  | ≥ 1 | ≥ 1 |  |  |
| Note 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.  NOTE 2: Throughput (in kbps) will depend on SA period configuration | | | | | | | |

Table A.6.2-3: Fixed Reference measurement channel for ProSe Direct Communication  
for maximum input power for UE categories 2-8

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Subcarriers per resource block |  |  |  | 12 | 12 |  |  |
| Packets per SA period |  |  |  | 1 | 1 |  |  |
| Modulation |  |  |  | 16QAM | 16QAM |  |  |
| Transport Block Size |  |  |  | 9912 | 18336 |  |  |
| Transport block CRC | Bits |  |  | 24 | 24 |  |  |
| Maximum number of HARQ transmissions |  |  |  | 4 | 4 |  |  |
| Binary Channel Bits | Bits |  |  | 14400 | 28800 |  |  |
| Max. Throughput averaged over 1 SA period of 40ms | kbps |  |  | 247.8 | 458.4 |  |  |
| Note 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.  Note 2: 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 3: Throughput (in kbps) will depend on SA period configuration | | | | | | | |

Table A.6.2-4: Fixed Reference measurement channel for ProSe Direct Communication  
for maximum input power for UE category 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 25 | 24 |  |  |
| Subcarriers per resource block |  |  |  | 12 | 12 |  |  |
| Packets per SA period |  |  |  | 1 | 1 |  |  |
| Modulation |  |  |  | 16QAM | 16QAM |  |  |
| Transport Block Size |  |  |  | 9912 | 10296 |  |  |
| Transport block CRC | Bits |  |  | 24 | 24 |  |  |
| Maximum number of HARQ transmissions |  |  |  | 4 | 4 |  |  |
| Binary Channel Bits | Bits |  |  | 14400 | 13824 |  |  |
| Max. Throughput averaged over 1 SA period of 40ms | kbps |  |  | 247.8 | 257.4 |  |  |
| Note 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.  Note 2: 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 3: Throughput (in kbps) will depend on SA period configuration | | | | | | | |

## A.6.3 Reference measurement channels for PSDCH performance requirements

Table A.6.3-1: Fixed Reference measurement channel for PSDCH performance requirement

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Reference channel |  | D.1 FDD / D.1 TDD | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  | 2 | 2 | 2 | 2 |
| Subcarriers per resource block |  |  |  | 12 | 12 | 12 | 12 |
| DFT-OFDM Symbols per subframe (NOTE 1) |  |  |  | 11 | 11 | 11 | 11 |
| Modulation |  |  |  | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size |  |  |  | 232 | 232 | 232 | 232 |
| Transport block CRC | Bits |  |  | 24 | 24 | 24 | 24 |
| Binary Channel Bits (NOTE 1) | Bits |  |  | 528 | 528 | 528 | 528 |
| Max. Throughput averaged over 1 Discovery period of 320ms | kbps |  |  | 0.725 | 0.725 | 0.725 | 0.725 |
| UE Category |  |  |  | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| NOTE1: PSDCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211. | | | | | | | |

## A.6.4 Reference measurement channels for PSCCH performance requirements

Table A.6.4-1: Fixed reference measurement channel for PSCCH performance requirement

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | | |
| Reference channel | |  | CC.1 FDD | CC.2 FDD | CC.3 FDD | CC.4 FDD | CC.5 FDD | CC.6 FDD |
| Channel bandwidth | | MHz | 5 | 10 | 5 | 10 | 5 | 10 |
| Allocated resource blocks | |  | 1 | 1 | 1 | 1 | 1 | 1 |
| Subcarriers per resource block | |  | 12 | 12 | 12 | 12 | 12 | 12 |
| DFT-OFDM Symbols per subframe  (see Note 1) | |  | 11 | 11 | 11 | 11 | 11 | 11 |
| Modulation | |  | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size | | Bits | 41 | 43 | 41 | 43 | 41 | 43 |
| Information bits | Frequency hopping flag |  | 0 | 0 | 1 | 1 | 1 | 1 |
| RB assignment |  | Set as per PSSCH RB allocation specific in the test | | | | | |
| Hopping bits |  | N/A | N/A | 1  Type 2 Hopping | (1,1)  Type 2 Hopping | 0  Type 1 Hopping | (1,0)  Type 1 Hopping |
| Time resource pattern (ITRP) |  | 8 (unless specified otherwise in the test)  (Note 3) | | | | | |
| Modulation and coding scheme |  | Set as the PSSCH MCS specified in the test | | | | | |
| Timing advance indication |  | 0 (unless specified otherwise in the test) | | | | | |
| Group destination ID |  | As set by higher layers | | | | | |
| Transport block CRC | | Bits | 16 | 16 | 16 | 16 | 16 | 16 |
| Maximum number of HARQ transmissions | |  | 2 | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits (see Note 1,2) | | Bits | 264 | 264 | 264 | 264 | 264 | 264 |
| Max. Throughput averaged over one sc-period (bits/sc-period) | |  | 41 | 43 | 41 | 43 | 41 | 43 |
| Note 1: PSCCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  Note 2: Binary channel bits per HARQ transmission.  NOTE 3: For NTRP = 8 (FDD) and *trpt-Subset* = 010, ITRP = 8 corresponds to a time repetition pattern of (1,1,0,0,0,0,0,0) as per TS 36.213. | | | | | | | | |

## A.6.5 Reference measurement channels for PSSCH performance requirements

Table A.6.5-1: Fixed reference measurement channel for PSSCH performance requirement

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | CD.1 FDD | CD.2 FDD | CD.3 FDD | CD.4 FDD | CD.5 FDD |
| Channel bandwidth | MHz | 5 / 10 | 5 / 10 | 5 | 10 | 5 / 10 |
| Allocated resource blocks |  | 10 | 10 | 25 | 50 | 2 |
| Subcarriers per resource block |  | 12 | 12 | 12 | 12 | 12 |
| DFT-OFDM Symbols per subframe  (see Note 1) |  | 11 | 11 | 11 | 11 | 11 |
| Modulation |  | QPSK | 16QAM | 16QAM | 16QAM | QPSK |
| Transport Block Size |  | 872 | 2536 | 6456 | 12960 | 328 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 |
| Maximum number of HARQ transmissions |  | 4 | 4 | 4 | 4 | 4 |
| Binary Channel Bits (see Note 1,2) | Bits | 2640 | 5280 | 13200 | 26400 | 528 |
| Max. Throughput averaged over one sc-period (bits/sc-period) |  | 872 | 2536 | 6456 | 12960 | 328 |
| Note 1: PSSCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  Note 2: Binary channel bits per HARQ transmission.  Note 3: 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). | | | | | | |

Table A.6.5-2: Fixed reference measurement channel for PSSCH for maximum Sidelink processes test

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | CD.6 FDD | CD.7 FDD |
| Channel bandwidth | MHz | 5 | 10 |
| Allocated resource blocks |  | 25 | 50 |
| Subcarriers per resource block |  | 12 | 12 |
| DFT-OFDM Symbols per subframe  (see Note 1) |  | 11 | 11 |
| Modulation |  | 16QAM | 16QAM |
| Transport Block Size |  | 15840 | 25456 |
| Transport block CRC | Bits | 24 | 24 |
| Maximum number of HARQ transmissions |  | 4 | 4 |
| Binary Channel Bits (see Note 1,2) | Bits | 13200 | 26400 |
| Max. Throughput averaged over one sc-period (bits/sc-period) |  | 15840 | 25456 |
| Note 1: PSSCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  Note 2: Binary channel bits per HARQ transmission.  Note 3: 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). | | | |

## A.6.6 Reference measurement channels for PSBCH performance requirements

Table A.6.6-1: Fixed reference measurement channel for PSBCH performance requirement

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | CP.1 FDD |
| Channel bandwidth | MHz | 5 / 10 |
| Allocated resource blocks |  | 6 |
| Subcarriers per resource block |  | 12 |
| DFT-OFDM Symbols per subframe  (see Note 1) |  | 7 |
| Modulation |  | QPSK |
| Transport Block Size |  | 40 |
| Transport block CRC | Bits | 16 |
| Maximum number of HARQ transmissions |  | 1 |
| Binary Channel Bits (see Note 1,2) | Bits | 1008 |
| Max. Throughput averaged over 40ms | kbps | 1 |
| Note 1: PSBCH transmissions are rate-matched for 8 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  NOTE 2: Binary channel bits per HARQ transmission. | | |

# A.7 Sidelink reference resource pool configurations

## A.7.1 Reference resource pool configurations for ProSe Direct Discovery demodulation tests

### A.7.1.1 FDD

Table A.7.1.1-1: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #1-FDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value |
| discRxPool | cp-Len |  | Normal |
|  | discPeriod |  | rf32 |
|  | numRetx |  | 0 |
|  | numRepetition |  | 1 |
|  | tf-ResourceConfig | prb-Num | 12 |
|  |  | prb-Start | 0 |
|  |  | prb-End | 23 |
|  |  | offsetIndicator | 160 |
|  |  | subframeBitmap | 10000000  00000000  00000000  00000000  00000000 |
|  | txParameters |  | not present |
|  | rxParameters |  | not present |
| discTxPoolCommon |  |  | not present |
| discTxPowerInfo |  |  | not present |
| SL-SyncConfig |  |  | not present |
| discInterFreqList |  |  | not present |

Table A.7.1.1-2: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #2-FDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value |
| discRxPool(0) | cp-Len |  | Normal |
|  | discPeriod |  | rf32 |
|  | numRetx |  | 0 |
|  | numRepetition |  | 1 |
|  | tf-ResourceConfig | prb-Num | 12 |
|  |  | prb-Start | 0 |
|  |  | prb-End | 23 |
|  |  | offsetIndicator | 150 |
|  |  | subframeBitmap | 10000000  00000000  00000000  00000000  00000000 |
|  | txParameters |  | not present |
|  | rxParameters |  | not present |
| discRxPool(1) | cp-Len |  | Normal |
|  | discPeriod |  | rf32 |
|  | numRetx |  | 0 |
|  | numRepetition |  | 1 |
|  | tf-ResourceConfig | prb-Num | 12 |
|  |  | prb-Start | 0 |
|  |  | prb-End | 23 |
|  |  | offsetIndicator | 170 |
|  |  | subframeBitmap | 10000000  00000000  00000000  00000000  00000000 |
|  | txParameters |  | not present |
|  | rxParameters | tdd-Config | not present |
|  |  | syncConfigIndex | 0 |
| discTxPoolCommon |  |  | not present |
| discTxPowerInfo |  |  | not present |
| SL-SyncConfig(0) | syncCP-Len |  | Normal |
|  | syncOffsetIndicator |  | 0 (160 mod 40) |
|  | slssid |  | 30 |
|  | txParameters |  | not present |
|  | rxParamsNCell | physCellId | 1 |
|  |  | discSyncWindow | w1 |
| discInterFreqList |  |  | not present |

Table A.7.1.1-3: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #3-FDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value |
| discRxPool(iPool),  iPool = 0…NPool-1 | cp-Len |  | Normal |
|  | discPeriod |  | rf32 |
|  | numRetx |  | 3 |
|  | numRepetition |  | =2 if NPool > 10,  =1 otherwise |
|  | tf-ResourceConfig | prb-Num | 5MHz: min{24, 2N-24\*iPool} / 2  10MHz: 25  15MHz: min{74, 2N-74\*iPool} / 2  20MHz: 50 |
|  |  | prb-Start | 0 |
|  |  | prb-End | 5 MHz: min{24, 2N-24\*iPool} - 1  10 MHz: 49  15 MHz: min{74, 2N-74\*iPool} - 1  20 MHz: 99 |
|  |  | offsetIndicator | 160 |
|  |  | subframeBitmap | a(0), a(1), …, a(39), s.t.  a(i \* NPool + iPool) = 1, i = 0,..,K;  a(k) = 0 otherwise  where  K = 1 is NPool > 10, K = 3 otherwise |
|  | txParameters |  | not present |
|  | rxParameters |  | not present |
| discTxPoolCommon |  |  | not present |
| discTxPowerInfo |  |  | not present |
| SL-SyncConfig |  |  | not present |
| discInterFreqList |  |  | not present |
| NOTE 1: The resource pool configuration description is parameterized using channel BW, number of configured resource pools (NPool), and maximum number of configured Sidelink UEs to be supported (N). | | | |

Table A.7.1.1-4: ProSe Direct Discovery configuration for E-UTRA FDD for out-of-network coverage operation (Configuration #4-FDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Information Element | | | | Value | | |
| 5MHz | 10MHz | |
| preconfigSync | syncCP-Len-r12 |  |  | Normal | | |
|  | syncOffsetIndicator1 |  |  | 1 | | |
|  | syncOffsetIndicator2 |  |  | 2 | | |
|  | syncTxParameters |  |  | 23 | | |
|  | syncTxThreshOoC |  |  | 0  (-110dBm / 15kHz) | | |
|  | filterCoefficient |  |  | fc0 | | |
|  | syncRefMinHyst |  |  | dB0 | | |
|  | syncRefDiffHyst |  |  | dB0 | | |
|  | syncTxPeriodic |  |  | TRUE | | |
| preconfigDisc | discRxPoolList(0) | cp-Len |  | Normal | | |
|  |  | discPeriod |  | rf4 | | |
|  |  | numRetx |  | 0 | | |
|  |  | numRepetition |  | 1 | | |
|  |  | tf-ResourceConfig | prb-Num | 12 | | 25 |
|  |  |  | prb-Start | 0 | | 0 |
|  |  |  | prb-End | 23 | | 49 |
|  |  |  | offsetIndicator | 0 | | |
|  |  |  | subframeBitmap | 00000000  10000000  00000000  00000000  00000000 | | |
|  |  | txParameters |  | not present | | |

### A.7.1.2 TDD

Table A.7.1.2-1: ProSe Direct Discovery configuration for E-UTRA TDD Config 0 (Configuration #1-TDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value |
| discRxPool | cp-Len |  | Normal |
|  | discPeriod |  | rf32 |
|  | numRetx |  | 0 |
|  | numRepetition |  | 1 |
|  | tf-ResourceConfig | prb-Num | 12 |
|  |  | prb-Start | 0 |
|  |  | prb-End | 23 |
|  |  | offsetIndicator | 163 |
|  |  | subframeBitmap | 10000000  00000000  00000000  00000000  00000000  00 |
|  | txParameters |  | not present |
|  | rxParameters |  | not present |
| discTxPoolCommon |  |  | not present |
| discTxPowerInfo |  |  | not present |
| SL-SyncConfig |  |  | not present |
| discInterFreqList |  |  | not present |

Table A.7.1.2-2: ProSe Direct Discovery configuration for E-UTRA TDD (Configuration #2-TDD)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value |
| discRxPool(iPool),  iPool = 0…NPool-1 | cp-Len |  | Normal |
|  | discPeriod |  | rf32 |
|  | numRetx |  | 3 |
|  | numRepetition |  | =2 if NPool > 10,  =1 otherwise |
|  | tf-ResourceConfig | prb-Num | 5MHz: min{24, 2N-24\*iPool} / 2  10MHz: 25  15MHz: min{74, 2N-74\*iPool} / 2  20MHz: 50 |
|  |  | prb-Start | 0 |
|  |  | prb-End | 5 MHz: min{24, 2N-24\*iPool} - 1  10 MHz: 49  15 MHz: min{74, 2N-74\*iPool} - 1  20 MHz: 99 |
|  |  | offsetIndicator | 163 |
|  |  | subframeBitmap | a(0), a(1), …, a(39), s.t.  a(i \* NPool + iPool) = 1, i = 0,..,K;  a(k) = 0 otherwise  where  K = 1 is NPool > 10, K = 3 otherwise |
|  | txParameters |  | not present |
|  | rxParameters |  | not present |
| discTxPoolCommon |  |  | not present |
| discTxPowerInfo |  |  | not present |
| SL-SyncConfig |  |  | not present |
| discInterFreqList |  |  | not present |
| NOTE 1: The resource pool configuration description is parameterized using channel BWs, number of configured resource pools (NPool), and maximum number of configured Sidelink UE to be supported (N). | | | |

## A.7.2 Reference resource pool configurations for ProSe Direct Communication demodulation tests

### A.7.2.1 FDD

Table A.7.2.1-1: ProSe Direct Communication pre-configuration for E-UTRAN FDD for out-of-network coverage operation (Configuration #1-FDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Information Element / (BW configuration) | | |  | Value  (5MHz) | Value  (10MHz) | |
| preconfigSync | syncCP-Len-r12 |  |  | Normal | | |
|  | syncOffsetIndicator1 |  |  | 1 | | |
|  | syncOffsetIndicator2 |  |  | 2 | | |
|  | syncTxParameters |  |  | 23 | | |
|  | syncTxThreshOoC |  |  | 0  (-110dBm / 15kHz) | | |
|  | filterCoefficient |  |  | fc0 | | |
|  | syncRefMinHyst |  |  | dB0 | | |
|  | syncRefDiffHyst |  |  | dB0 | | |
| preconfigComm | sc-CP-Len |  |  | Normal | | |
|  | sc-Period |  |  | sf40 | | |
|  | sc-TF-ResourceConfig | prb-Num |  | 13 | 25 | |
|  |  | prb-Start |  | 0 | 0 | |
|  |  | prb-End |  | 24 | 49 | |
|  |  | offsetIndicator |  | 0 | | |
|  |  | subframeBitmap |  | 00011000  00000000  00000000  00000000  00000000 | | |
|  | data-CP-Len |  |  | Normal | | |
|  | dataHoppingConfig | hoppingParameter |  | 504 | | |
|  |  | numSubbands |  | ns2 | | |
|  |  | rb-Offset |  | 0 | | |
|  | ue-SelectedResourceConfig | data-TF-ResourceConfig | *prb-Num* | 13 | | 25 |
|  |  |  | *prb-Start* | 0 | | 0 |
|  |  |  | *prb-End* | 24 | | 49 |
|  |  |  | *offsetIndicator* | 0 | | |
|  |  |  | *subframeBitmap* | 00000000  11111111  11111111  00000000  00000000 | | |
|  |  | trpt-Subset-r12 |  | 010 | | |

Table A.7.2.1-2: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #2-FDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Information Element / (BW configuration) | | | | Value  (5MHz) | Value  (10MHz) | |
| commRxPool | sc-CP-Len |  |  | Normal | | |
|  | sc-Period |  |  | sf40 | | |
|  | sc-TF-ResourceConfig | prb-Num |  | 13 | 25 | |
|  |  | prb-Start |  | 0 | 0 | |
|  |  | prb-End |  | 24 | 49 | |
|  |  | offsetIndicator |  | 0 | | |
|  |  | subframeBitmap |  | 00111100  00000000  00000000  00000000  00000000 | | |
|  | data-CP-Len |  |  | Normal | | |
|  | dataHoppingConfig | hoppingParameter |  | 504 | | |
|  |  | numSubbands |  | ns2 | | |
|  |  | rb-Offset |  | 0 | | |
|  | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | | 25 |
|  |  |  | prb-Start | 0 | | 0 |
|  |  |  | prb-End | 24 | | 49 |
|  |  |  | offsetIndicator | 0 | | |
|  |  |  | subframeBitmap | 00000000  11111111  11111111  00000000  00000000 | | |
|  |  | trpt-Subset-r12 |  | 010 | | |
|  | rxParametersNCell |  |  | not present | | |
|  | txParameters |  |  | not present | | |
| commTxPoolNormalCommon |  |  |  | not present | | |
| SL-SyncConfig |  |  |  | not present | | |

Table A.7.2.1-3: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #3-FDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Information Element / (BW configuration) | | | | Value  (5MHz) | Value  (10MHz) | |
| commRxPool(0) | sc-CP-Len |  |  | Normal | | |
|  | sc-Period |  |  | sf40 | | |
|  | sc-TF-ResourceConfig | prb-Num |  | 13 | 25 | |
|  |  | prb-Start |  | 0 | 0 | |
|  |  | prb-End |  | 24 | 49 | |
|  |  | offsetIndicator |  | 0 | | |
|  |  | subframeBitmap |  | 00110000  00000000  00000000  00000000  00000000 | | |
|  | data-CP-Len |  |  | Normal | | |
|  | dataHoppingConfig | hoppingParameter |  | 504 | | |
|  |  | numSubbands |  | ns2 | | |
|  |  | rb-Offset |  | 0 | | |
|  | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | | 25 |
|  |  |  | prb-Start | 0 | | 0 |
|  |  |  | prb-End | 24 | | 49 |
|  |  |  | offsetIndicator | 0 | | |
|  |  |  | subframeBitmap | 00001111  11110000  00000000  11111111  00000000 | | |
|  |  | trpt-Subset-r12 |  | 010 | | |
|  | *rxParametersNCell* |  |  | not present | | |
|  | *txParameters* |  |  | not present | | |
| *commRxPool(1)* | *sc-CP-Len* |  |  | Normal | | |
|  | *sc-Period* |  |  | sf40 | | |
|  | *sc-TF-ResourceConfig* | *prb-Num* |  | 13 | | 25 |
|  |  | *prb-Start* |  | 0 | | 0 |
|  |  | *prb-End* |  | 24 | | 49 |
|  |  | *offsetIndicator* |  | 0 | | |
|  |  | *subframeBitmap* |  | 00110000  00000000  00000000  00000000  00000000 | | |
|  | *data-CP-Len* |  |  | Normal | | |
|  | *dataHoppingConfig* | *hoppingParameter* |  | 504 | | |
|  |  | *numSubbands* |  | ns2 | | |
|  |  | *rb-Offset* |  | 0 | | |
|  | *ue-SelectedResourceConfig* | *data-TF-ResourceConfig* | *prb-Num* | 13 | | 25 |
|  |  |  | *prb-Start* | 0 | | 0 |
|  |  |  | *prb-End* | 24 | | 49 |
|  |  |  | *offsetIndicator* | 0 | | |
|  |  |  | *subframeBitmap* | 00001111  11110000  00001111  11110000  00000000 | | |
|  |  | *trpt-Subset-r12* |  | 010 | | |
|  | *rxParametersNCell* | *tdd-Config* |  | not present | | |
|  |  | *syncConfigIndex* |  | 0 | | |
|  | *txParameters* |  |  | not present | | |
| *commTxPoolNormalCommon* |  |  |  | not present | | |
| *SL-SyncConfig(0)* | *syncCP-Len* |  |  | Normal | | |
|  | *syncOffsetIndicator* |  |  | 1 | | |
|  | *slssid* |  |  | 30 | | |
|  | *txParameters* |  |  | not present | | |
|  | rxParamsNCell | physCellId |  | 1 | | |
|  |  | discSyncWindow |  | w1 | | |

Table A.7.2.1-4: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #4-FDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Information Element / (BW configuration) | | | | Value  (5MHz) | Value  (10MHz) | |
| commRxPool(0) | sc-CP-Len |  |  | Normal | | |
|  | sc-Period |  |  | sf80 | | |
|  | sc-TF-ResourceConfig | prb-Num |  | 13 | 25 | |
|  |  | prb-Start |  | 0 | 0 | |
|  |  | prb-End |  | 24 | 49 | |
|  |  | offsetIndicator |  | 0 | | |
|  |  | subframeBitmap |  | 11110000  00000000  00000000  00000000  00000000 | | |
|  | data-CP-Len |  |  | Normal | | |
|  | dataHoppingConfig | hoppingParameter |  | 504 | | |
|  |  | numSubbands |  | ns2 | | |
|  |  | rb-Offset |  | 0 | | |
|  | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | | 25 |
|  |  |  | prb-Start | 0 | | 0 |
|  |  |  | prb-End | 24 | | 49 |
|  |  |  | offsetIndicator | 0 | | |
|  |  |  | subframeBitmap | 00000000  11111111  00000000  11111111  00000000 | | |
|  |  | trpt-Subset-r12 |  | 001 | | |
|  | rxParametersNCell |  |  | not present | | |
|  | txParameters |  |  | not present | | |
| commRxPool(1) | sc-CP-Len |  |  | Normal | | |
|  | sc-Period |  |  | sf80 | | |
|  | sc-TF-ResourceConfig | prb-Num |  | 13 | | 25 |
|  |  | prb-Start |  | 0 | | 0 |
|  |  | prb-End |  | 24 | | 49 |
|  |  | offsetIndicator |  | 0 | | |
|  |  | subframeBitmap |  | 00001111  00000000  00000000  00000000  00000000 | | |
|  | data-CP-Len |  |  | Normal | | |
|  | dataHoppingConfig | hoppingParameter |  | 504 | | |
|  |  | numSubbands |  | ns2 | | |
|  |  | rb-Offset |  | 0 | | |
|  | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | | 25 |
|  |  |  | prb-Start | 0 | | 0 |
|  |  |  | prb-End | 24 | | 49 |
|  |  |  | offsetIndicator | 0 | | |
|  |  |  | subframeBitmap | 00000000  00000000  11111111  00000000  11111111 | | |
|  |  | trpt-Subset-r12 |  | 001 | | |
|  | rxParametersNCell |  |  | not present | | |
|  | txParameters |  |  | not present | | |
| commTxPoolNormalCommon |  |  |  | not present | | |
| SL-SyncConfig |  |  |  | not present | | |

Table A.7.2.1-5: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #5-FDD)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Information Element / (BW configuration) | | | | Value  (5MHz) | Value  (10MHz) | |
| commRxPool | sc-CP-Len |  |  | Normal | | |
|  | sc-Period |  |  | sf40 | | |
|  | sc-TF-ResourceConfig | prb-Num |  | 13 | 25 | |
|  |  | prb-Start |  | 0 | 0 | |
|  |  | prb-End |  | 24 | 49 | |
|  |  | offsetIndicator |  | 0 | | |
|  |  | subframeBitmap |  | 00011000  00000000  00000000  00000000  00000000 | | |
|  | data-CP-Len |  |  | Normal | | |
|  | dataHoppingConfig | hoppingParameter |  | 504 | | |
|  |  | numSubbands |  | ns2 | | |
|  |  | rb-Offset |  | 0 | | |
|  | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | | 25 |
|  |  |  | prb-Start | 0 | | 0 |
|  |  |  | prb-End | 24 | | 49 |
|  |  |  | offsetIndicator | 0 | | |
|  |  |  | subframeBitmap | 00000000  11111111  11111111  11111111  11111111 | | |
|  |  | trpt-Subset-r12 |  | 001 | | |
|  | rxParametersNCell |  |  | not present | | |
|  | txParameters |  |  | not present | | |
| commTxPoolNormalCommon |  |  |  | not present | | |
| SL-SyncConfig |  |  |  | not present | | |

# A.8 V2X reference measurement channels

## A.8.1 General

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 section 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 section 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.

### A.8.1.1 Overview of V2X reference measurement channels

In Table A.8.1.1-1 are listed the Sidelink reference measurement channels specified in annexes A.8.2 to A.8.6 of this release of TS 36.101. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation’s parameters as to be used for requirements are annexes A.8.2 to A.8.6 as appropriate.

Table A.8.1.1-1: Overview of Sidelink reference measurement channels

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Table | Name | BW | Mod | TCR | RB | UE Categ | Notes |
| Table A.8.2-1 | - | 10 | QPSK | 1/3 | 48 | SL-C Category 2  SL-C-RX Category ≥ 2 |  |
| Table A.8.2-1 | - | 20 | QPSK | 1/3 | 96 | SL-C Category 2  SL-C-RX Category ≥ 2 |  |
| Table A.8.2-2 | - | 10 | 16QAM | 2/3 | 48 | SL-C Category 2  SL-C-RX Category ≥ 2 |  |
| Table A.8.2-2 | - | 20 | 16QAM | 2/3 | 96 | SL-C Category 2  SL-C-RX Category ≥ 2 |  |
| Table A.8.2-4 | - | 10 | 64QAM | 3/4 | 48 | SL-C-RX Category ≥ 3 |  |
| Table A.8.2-4 | - | 20 | 64QAM | 3/4 | 96 | SL-C-RX Category ≥ 3 |  |
| Table A.8.3-1 |  | 10/20 | QPSK | 1/3 | - | SL-C Category 2  SL-C-TX Category ≥ 2 |  |
| Table A.8.3-2 |  | 10/20 | 16QAM | 2/3 | - | SL-C Category 2  SL-C-TX Category ≥ 2 |  |
| Table A.8.3-3 |  | 10/20 | 64QAM | 3/4 | - | SL-C-TX Category ≥ 3 |  |
| Table A.8.4-1 | CC.8 | 10/20 | QPSK | - | 2 | - |  |
| Table A.8.5-1 | CD.8 | 20 | 16QAM | - | 8 | - |  |
| Table A.8.5-1 | CD.9 | 10 | QPSK | - | 3 | - |  |
| Table A.8.5-1 | CD.10 | 20 | QPSK | - | 3 | - |  |
| Table A.8.5-1 | CD.11 | 20 | 16QAM | - | 96 | - |  |
| Table A.8.5-1 | CD.12 | 20 | QPSK | - | 8 | - |  |
| Table A.8.5-2 | CD.13 | 20 | 64QAM | - | 8 | - |  |
| Table A.8.5-2 | CD.14 | 10 | QPSK | - | 3 | - |  |
| Table A.8.5-2 | CD.15 | 20 | 64QAM | - | 96 | - |  |
| Table A.8.5-2 | CD.16 | 10 | 64QAM | - | 48 | - |  |
| Table A.8.5-2 | CD.17 | 20 | QPSK | - | 8 | - |  |
| Table A.8.5-2 | CD.18 | 10 | QPSK | - | 8 | - |  |
| Table A.8.5-2 | CD.19 | 20 | QPSK | - | 3 | - |  |
| Table A.8.5-2 | CD.20 | 10 | QPSK | - | 3 | - |  |
| Table A.8.6-1 | CP.2 | 20 | QPSK | - | 6 | - |  |

## A.8.2 Reference measurement channel for receiver characteristics

For V2X side link transmission over PC5, Table A.8.2-1 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of Maximum input level (subclause 7.4G). Table A.8.2-2 and Table A.8.2-3, are applicable for Maximum input level (subclause 7.4G).

Table A.8.2-1 Fixed Reference measurement channel for V2X receiver requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 48 |  | 96 |
| Subcarriers per resource block |  |  |  |  | 12 |  | 12 |
| Packets per period |  |  |  |  | 1 |  | 1 |
| Modulation |  |  |  |  | QPSK |  | QPSK |
| Target Coding Rate |  |  |  |  | 1/3 |  | 1/3 |
| Transport Block Size |  |  |  |  | 3496 |  | 6968 |
| Transport block CRC | Bits |  |  |  | 24 |  | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  | 1 |  | 2 |
| Maximum number of HARQ transmissions |  |  |  |  | 1 |  | 1 |
| Binary Channel Bits per subframe | Bits |  |  |  | 11520 |  | 23040 |
| Max. Throughput averaged over 1 period of 100ms | kbps |  |  |  | 34.96 |  | 69.68 |
| UE Category |  |  |  |  | ≥ 1 |  | ≥ 1 |
| Note 1: 2RBs allocated to SA transmission and 4 symbols allocated to RS.  Note 2: Throughput (in kbps) will depend on SA period configuration.  Note 3: 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). | | | | | | | |

Table A.8.2-2 Fixed Reference measurement channel for V2X maximum input level requirements for 16QAM

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 48 |  | 96 |
| Subcarriers per resource block |  |  |  |  | 12 |  | 12 |
| Packets per period |  |  |  |  | 1 |  | 1 |
| Modulation |  |  |  |  | 16QAM |  | 16QAM |
| Target Coding Rate |  |  |  |  | 2/3 |  | 2/3 |
| Transport Block Size |  |  |  |  | 15840 |  | 29296 |
| Transport block CRC | Bits |  |  |  | 24 |  | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  | 3 |  | 5 |
| Maximum number of HARQ transmissions |  |  |  |  | 1 |  | 1 |
| Binary Channel Bits per subframe | Bits |  |  |  | 23040 |  | 46080 |
| Max. Throughput averaged over 1 period of 100ms | kbps |  |  |  | 158.4 |  | 292.96 |
| Note 1: 2RBs allocated to SA transmission and 4 symbols allocated to RS.  Note 2: Throughput (in kbps) will depend on SA period configuration.  Note 3: 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). | | | | | | | |

Table A.8.2-3 (Void)

Table A.8.2-4 Fixed Reference measurement channel for V2X maximum input level for 64QAM

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks |  |  |  |  | 48 |  | 96 |
| Subcarriers per resource block |  |  |  |  | 12 |  | 12 |
| Packets per period |  |  |  |  | 1 |  | 1 |
| Modulation |  |  |  |  | 64QAM |  | 64QAM |
| Target Coding Rate |  |  |  |  | 3/4 |  | 3/4 |
| Transport Block Size |  |  |  |  | 22920 |  | 46888 |
| Transport block CRC | Bits |  |  |  | 24 |  | 24 |
| Number of Code Blocks per Sub-Frame |  |  |  |  | 4 |  | 8 |
| Maximum number of HARQ transmissions |  |  |  |  | 1 |  | 1 |
| Binary Channel Bits per subframe | Bits |  |  |  | 31104 |  | 62208 |
| Max. Throughput averaged over 1 period of 100ms | kbps |  |  |  | 229.2 |  | 468.88 |
| Note 1: 2RBs allocated to SA transmission, 4 symbols allocated to RS and the last symbol within a subframe is not considered in the mapping process  Note 2: Throughput (in kbps) will depend on SA period configuration.  Note 3: 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). | | | | | | | |

## A.8.3 Reference measurement channel for transmitter characteristics

For V2X side link transmission over PC5, Table A.8.3-1 and Table A.8.3-2 are applicable for measurements on the Transmitter Characteristics (clause 6).

Table A.8.3-1 Fixed Reference measurement channel for V2X Transmitter requirements for QPSK

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |
|  | 10, 20 | 3 | 10 | QPSK | 1/3 | 208 | 24 | 1 | 720 | 360 |
|  | 10, 20 | 4 | 10 | QPSK | 1/3 | 256 | 24 | 1 | 960 | 480 |
|  | 10, 20 | 5 | 10 | QPSK | 1/3 | 328 | 24 | 1 | 1200 | 600 |
|  | 10, 20 | 6 | 10 | QPSK | 1/3 | 408 | 24 | 1 | 1440 | 720 |
|  | 10, 20 | 8 | 10 | QPSK | 1/3 | 552 | 24 | 1 | 1920 | 960 |
|  | 10, 20 | 9 | 10 | QPSK | 1/3 | 632 | 24 | 1 | 2160 | 1080 |
|  | 10, 20 | 10 | 10 | QPSK | 1/3 | 696 | 24 | 1 | 2400 | 1200 |
|  | 10, 20 | 12 | 10 | QPSK | 1/3 | 840 | 24 | 1 | 2880 | 1440 |
|  | 10, 20 | 15 | 10 | QPSK | 1/3 | 1064 | 24 | 1 | 3600 | 1800 |
|  | 10, 20 | 16 | 10 | QPSK | 1/3 | 1128 | 24 | 1 | 3840 | 1920 |
|  | 10, 20 | 18 | 10 | QPSK | 1/3 | 1288 | 24 | 1 | 4320 | 2160 |
|  | 10, 20 | 20 | 10 | QPSK | 1/3 | 1416 | 24 | 1 | 4800 | 2400 |
|  | 10, 20 | 24 | 10 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 |
|  | 10, 20 | 25 | 10 | QPSK | 1/3 | 1800 | 24 | 1 | 6000 | 3000 |
|  | 10, 20 | 27 | 10 | QPSK | 1/3 | 1928 | 24 | 1 | 6480 | 3240 |
|  | 10, 20 | 30 | 10 | QPSK | 1/3 | 2152 | 24 | 1 | 7200 | 3600 |
|  | 10, 20 | 32 | 10 | QPSK | 1/3 | 2280 | 24 | 1 | 7680 | 3840 |
|  | 10, 20 | 36 | 10 | QPSK | 1/3 | 2600 | 24 | 1 | 8640 | 4320 |
|  | 10, 20 | 40 | 10 | QPSK | 1/3 | 2856 | 24 | 1 | 9600 | 4800 |
|  | 10, 20 | 45 | 10 | QPSK | 1/3 | 3240 | 24 | 1 | 10800 | 5400 |
|  | 10, 20 | 48 | 10 | QPSK | 1/3 | 3496 | 24 | 1 | 11520 | 5760 |
|  | 20 | 50 | 10 | QPSK | 1/3 | 3624 | 24 | 1 | 24000 | 12000 |
|  | 20 | 54 | 10 | QPSK | 1/3 | 4776 | 24 | 1 | 25920 | 12960 |
|  | 20 | 60 | 10 | QPSK | 1/3 | 5352 | 24 | 1 | 28800 | 14400 |
|  | 20 | 64 | 10 | QPSK | 1/3 | 4584 | 24 | 1 | 30720 | 15360 |
|  | 20 | 72 | 10 | QPSK | 1/3 | 5160 | 24 | 1 | 34560 | 17280 |
|  | 20 | 75 | 10 | QPSK | 1/3 | 5352 | 24 | 1 | 36000 | 18000 |
|  | 20 | 80 | 10 | QPSK | 1/3 | 5736 | 24 | 1 | 38400 | 19200 |
|  | 20 | 81 | 10 | QPSK | 1/3 | 5736 | 24 | 1 | 38880 | 19440 |
|  | 20 | 90 | 10 | QPSK | 1/3 | 6456 | 24 | 2 | 43200 | 21600 |
|  | 20 | 96 | 10 | QPSK | 1/3 | 6968 | 24 | 2 | 46080 | 23040 |

Table A.8.3-2 Fixed Reference measurement channel for V2X Transmitter requirements for 16QAM

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |
|  | 10, 20 | 3 | 10 | 16QAM | 2/3 | 904 | 24 | 1 | 1440 | 360 |
|  | 10, 20 | 4 | 10 | 16QAM | 2/3 | 1224 | 24 | 1 | 1920 | 480 |
|  | 10, 20 | 5 | 10 | 16QAM | 2/3 | 1544 | 24 | 1 | 2400 | 600 |
|  | 10, 20 | 6 | 10 | 16QAM | 2/3 | 1800 | 24 | 1 | 2880 | 720 |
|  | 10, 20 | 8 | 10 | 16QAM | 2/3 | 2472 | 24 | 1 | 3840 | 960 |
|  | 10, 20 | 9 | 10 | 16QAM | 2/3 | 2728 | 24 | 1 | 4320 | 1080 |
|  | 10, 20 | 10 | 10 | 16QAM | 2/3 | 3112 | 24 | 1 | 4800 | 1200 |
|  | 10, 20 | 12 | 10 | 16QAM | 2/3 | 3624 | 24 | 1 | 5760 | 1440 |
|  | 10, 20 | 15 | 10 | 16QAM | 2/3 | 4584 | 24 | 1 | 7200 | 1800 |
|  | 10, 20 | 16 | 10 | 16QAM | 2/3 | 4968 | 24 | 1 | 7680 | 1920 |
|  | 10, 20 | 18 | 10 | 16QAM | 2/3 | 5544 | 24 | 1 | 8640 | 2160 |
|  | 10, 20 | 20 | 10 | 16QAM | 2/3 | 6200 | 24 | 2 | 9600 | 2400 |
|  | 10, 20 | 24 | 10 | 16QAM | 2/3 | 7736 | 24 | 2 | 11520 | 2880 |
|  | 10, 20 | 25 | 10 | 16QAM | 2/3 | 7992 | 24 | 2 | 12000 | 3000 |
|  | 10, 20 | 27 | 10 | 16QAM | 2/3 | 8760 | 24 | 2 | 12960 | 3240 |
|  | 10, 20 | 30 | 10 | 16QAM | 2/3 | 9912 | 24 | 2 | 14400 | 3600 |
|  | 10, 20 | 32 | 10 | 16QAM | 2/3 | 10296 | 24 | 2 | 15360 | 3840 |
|  | 10, 20 | 36 | 10 | 16QAM | 2/3 | 11832 | 24 | 2 | 17280 | 4320 |
|  | 10, 20 | 40 | 10 | 16QAM | 2/3 | 12960 | 24 | 3 | 19200 | 4800 |
|  | 10, 20 | 45 | 10 | 16QAM | 2/3 | 14688 | 24 | 3 | 21600 | 5400 |
|  | 10, 20 | 48 | 10 | 16QAM | 2/3 | 15840 | 24 | 3 | 23040 | 5760 |
|  | 20 | 50 | 10 | 16QAM | 2/3 | 16416 | 24 | 3 | 24000 | 6000 |
|  | 20 | 54 | 10 | 16QAM | 2/3 | 17568 | 24 | 3 | 25920 | 6480 |
|  | 20 | 60 | 10 | 16QAM | 2/3 | 18336 | 24 | 3 | 28800 | 7200 |
|  | 20 | 64 | 10 | 16QAM | 2/3 | 20616 | 24 | 4 | 30720 | 7680 |
|  | 20 | 72 | 10 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 |
|  | 20 | 75 | 10 | 16QAM | 2/3 | 24496 | 24 | 4 | 36000 | 9000 |
|  | 20 | 80 | 10 | 16QAM | 2/3 | 26416 | 24 | 5 | 38400 | 9600 |
|  | 20 | 81 | 10 | 16QAM | 2/3 | 26416 | 24 | 5 | 38880 | 9720 |
|  | 20 | 90 | 10 | 16QAM | 2/3 | 29296 | 24 | 5 | 43200 | 10800 |
|  | 20 | 96 | 10 | 16QAM | 2/3 | 29296 | 24 | 5 | 46080 | 11520 |

Table A.8.3-3 Fixed Reference measurement channel for V2X Transmitter requirements for 64QAM

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod’n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame |
| Unit | MHz |  |  |  |  | Bits | Bits |  | Bits |  |
|  | 10, 20 | 3 | 9 | 64QAM | 3/4 | 1480 | 24 | 1 | 1944 | 324 |
|  | 10, 20 | 4 | 9 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 |
|  | 10, 20 | 5 | 9 | 64QAM | 3/4 | 2408 | 24 | 1 | 3240 | 540 |
|  | 10, 20 | 6 | 9 | 64QAM | 3/4 | 2984 | 24 | 1 | 3888 | 648 |
|  | 10, 20 | 8 | 9 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 |
|  | 10, 20 | 9 | 9 | 64QAM | 3/4 | 4392 | 24 | 1 | 5832 | 972 |
|  | 10, 20 | 10 | 9 | 64QAM | 3/4 | 4968 | 24 | 1 | 6480 | 1080 |
|  | 10, 20 | 12 | 9 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 |
|  | 10, 20 | 15 | 9 | 64QAM | 3/4 | 7224 | 24 | 2 | 9720 | 1620 |
|  | 10, 20 | 16 | 9 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 |
|  | 10, 20 | 18 | 9 | 64QAM | 3/4 | 8760 | 24 | 2 | 11664 | 1944 |
|  | 10, 20 | 20 | 9 | 64QAM | 3/4 | 9912 | 24 | 2 | 12960 | 2160 |
|  | 10, 20 | 24 | 9 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 |
|  | 10, 20 | 25 | 9 | 64QAM | 3/4 | 12216 | 24 | 2 | 16200 | 2700 |
|  | 10, 20 | 27 | 9 | 64QAM | 3/4 | 12960 | 24 | 3 | 17496 | 2916 |
|  | 10, 20 | 30 | 9 | 64QAM | 3/4 | 14688 | 24 | 3 | 19440 | 3240 |
|  | 10, 20 | 32 | 9 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 |
|  | 10, 20 | 36 | 9 | 64QAM | 3/4 | 17568 | 24 | 3 | 23328 | 3888 |
|  | 10, 20 | 40 | 9 | 64QAM | 3/4 | 19848 | 24 | 4 | 25920 | 4320 |
|  | 10, 20 | 45 | 9 | 64QAM | 3/4 | 22152 | 24 | 4 | 29160 | 4860 |
|  | 10, 20 | 48 | 9 | 64QAM | 3/4 | 22920 | 24 | 4 | 31104 | 5184 |
|  | 20 | 50 | 9 | 64QAM | 3/4 | 24496 | 24 | 4 | 32400 | 5400 |
|  | 20 | 54 | 9 | 64QAM | 3/4 | 26416 | 24 | 5 | 34992 | 5832 |
|  | 20 | 60 | 9 | 64QAM | 3/4 | 29296 | 24 | 5 | 38880 | 6480 |
|  | 20 | 64 | 9 | 64QAM | 3/4 | 31704 | 24 | 6 | 41472 | 6912 |
|  | 20 | 72 | 9 | 64QAM | 3/4 | 35160 | 24 | 6 | 46656 | 7776 |
|  | 20 | 75 | 9 | 64QAM | 3/4 | 36696 | 24 | 6 | 48600 | 8100 |
|  | 20 | 80 | 9 | 64QAM | 3/4 | 39232 | 24 | 7 | 51840 | 8640 |
|  | 20 | 81 | 9 | 64QAM | 3/4 | 39232 | 24 | 7 | 52488 | 8748 |
|  | 20 | 90 | 9 | 64QAM | 3/4 | 43816 | 24 | 8 | 58320 | 9720 |
|  | 20 | 96 | 9 | 64QAM | 3/4 | 46888 | 24 | 8 | 62208 | 10368 |

## A.8.4 Reference measurement for PSCCH performance requirements

Table A.8.4-1: Fixed reference measurement channel for PSCCH performance requirement

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | CC.8 |
| Allocated resource blocks |  | 2 |
| DFT-OFDM Symbols per subframe (see Note 1) |  | 9 |
| Modulation |  | QPSK |
| Payload (without CRC) | Bits | 32 |
| CRC | Bits | 16 |
| SCI Format |  | 1 |
| Number of PSCCH transmissions |  | 1 |
| Binary Channel Bits (see Note 2) | Bits | 432 |
| Note 1: PSCCH transmissions are rate-matched for 10 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  Note 2: Binary Channel Bits are calculated under assumption of 9 symbols.  Note 3: Un-used or redundant bits/code-points in SCI format 1 are randomized. | | |

## A.8.5 Reference measurement for PSSCH performance requirements

Table A.8.5-1: Fixed reference measurement channel for PSSCH performance requirement

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | |
| Reference channel |  | CD.8 | CD.9 | CD.10 | CD.11 | CD.12 |
| Channel bandwidth | MHz | 20 | 10 | 20 | 20 | 20 |
| Allocated resource blocks |  | 8 | 3 | 3 | 96 | 8 |
| DFT-OFDM Symbols per subframe (see Note 1) |  | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 16QAM | QPSK | QPSK | 16QAM | QPSK |
| Transport Block Size | Bits | 1800 | 208 | 504 | 31704 | 552 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of PSSCH transmissions |  | 1 | 2 | 1 | 2 | 1 |
| Binary Channel Bits (see Note 2) | Bits | 3456 | 648 | 648 | 41472 | 1728 |
| Note 1: PSSCH transmissions are rate-matched for 10 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  Note 2: Binary Channel Bits are calculated under assumption of 9 symbols.  Note 3: 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). | | | | | | |

Table A.8.5-2: Fixed reference measurement channel for PSSCH performance requirement

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | | |
| Reference channel |  | CD.13 | CD.14 | CD.15 | CD.16 | CD.17 | CD.18 | CD.19 | CD.20 |
| Channel bandwidth | MHz | 20 | 10 | 20 | 10 | 20 | 10 | 20 | 10 |
| Allocated resource blocks |  | 8 | 3 | 96 | 48 | 8 | 8 | 3 | 3 |
| DFT-OFDM Symbols per subframe (see Note 1) |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation |  | 64QAM | QPSK | 64QAM | 64QAM | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size | Bits | 2600 | 120 | 48936 | 24496 | 408 | 408 | 120 | 120 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of PSSCH transmissions |  | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| Binary Channel Bits (see Note 2) | Bits | 5184 | 648 | 62208 | 31104 | 1728 | 1728 | 648 | 648 |
| Note 1: PSSCH transmissions are rate-matched for 9 DFT-OFDM symbols per subframe.  Note 2: Binary Channel Bits are calculated under assumption of 9 symbols.  Note 3: 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). | | | | | | | | | |

## A.8.6 Reference measurement for PSBCH performance requirements

Table A.8.6-1: Fixed reference measurement channel for PSBCH performance requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference channel |  | CP.2 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 6 |
| DFT-OFDM Symbols per subframe (see Note 1) |  | 6 |
| Modulation |  | QPSK |
| Transport Block Size | Bits | 48 |
| Transport block CRC | Bits | 16 |
| Binary Channel Bits (see Note 2) | Bits | 864 |
| Note 1: PSBCH transmissions are rate-matched for 7 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.  Note 2: Binary Channel Bits are calculated under assumption of 6 symbols. | | | |

# A.9 V2X reference resource pool configurations

Table A.9-1: V2X sidelink communication pre-configuration for PSSCH/PSCCH tests (Configuration #1-V2X)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Information Element | | | Value  (10MHz) | Value  (20MHz) |
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 |  | 0 | |
|  | sl-Subframe-r14 | bs20-r14 | 0xFFFFF | |
|  | adjacencyPSCCH-PSSCH-r14 |  | TRUE | |
|  | sizeSubchannel-r14 |  | n5 | n10 |
|  | numSubchannel-r14 |  | n1 | |
|  | startRB-Subchannel-r14 |  | 0 | |
|  | startRB-PSCCH-Pool-r14 |  | not present | |
|  | dataTxParameters-r14 | P0-SL-r12 | -126 | |
|  | zoneID-r14 |  | not present | |
|  | threshS-RSSI-CBR-r14 |  | not present | |
|  | cbr-pssch-TxConfigList-r14 |  | not present | |
|  | resourceSelectionConfigP2X-r14 |  | not present | |
|  | syncAllowed-r14 |  | not present | |
|  | restrictResourceReservationPeriod-r14 |  | not present | |

Table A.9-2: V2X sidelink communication pre-configuration for power imbalance test (Configuration #2-V2X)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value  (20MHz) |
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 |  | 0 |
|  | sl-Subframe-r14 | bs20-r14 | 0xFFFFF |
|  | adjacencyPSCCH-PSSCH-r14 |  | TRUE |
|  | sizeSubchannel-r14 |  | n5 |
|  | numSubchannel-r14 |  | n10 |
|  | startRB-Subchannel-r14 |  | 0 |
|  | startRB-PSCCH-Pool-r14 |  | not present |
|  | dataTxParameters-r14 | P0-SL-r12 | -126 |
|  | zoneID-r14 |  | not present |
|  | threshS-RSSI-CBR-r14 |  | not present |
|  | cbr-pssch-TxConfigList-r14 |  | not present |
|  | resourceSelectionConfigP2X-r14 |  | not present |
|  | syncAllowed-r14 |  | not present |
|  | restrictResourceReservationPeriod-r14 |  | not present |

Table A.9-3: V2X sidelink communication communication configuration for PSSCH with eNB based synchronization test (Configuration #3-V2X)

|  |  |  |  |
| --- | --- | --- | --- |
| Information Element | | | Value  (20MHz) |
| SL-CommResourcePoolV2X-r14 | sl-OffsetIndicator-r14 |  | 0 |
|  | sl-Subframe-r14 | bs20-r14 | 0xFFFFF |
|  | adjacencyPSCCH-PSSCH-r14 |  | TRUE |
|  | sizeSubchannel-r14 |  | n10 |
|  | numSubchannel-r14 |  | n1 |
|  | startRB-Subchannel-r14 |  | 0 |
|  | startRB-PSCCH-Pool-r14 |  | not present |
|  | rxParametersNCell-r14 |  | not present |
|  | dataTxParameters-r14 | P0-SL-r12 | -126 |
|  | zoneID-r14 |  | not present |
|  | threshS-RSSI-CBR-r14 |  | not present |
|  | poolReportId-r14 |  | not present |
|  | cbr-pssch-TxConfigList-r14 |  | not present |
|  | resourceSelectionConfigP2X-r14 |  | not present |
|  | syncAllowed-r14 |  | not present |
|  | restrictResourceReservationPeriod-r14 |  | not present |
| SL-TypeTxSync-r14 |  |  | enb |

Table A.9-4: V2X sidelink communication pre-configuration for soft buffer test (Configuration #4-V2X)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Information Element | | | Value (10MHz) | Value  (20MHz) |
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 |  | 0 | |
|  | sl-Subframe-r14 | bs20-r14 | 0xFFFFF | |
|  | adjacencyPSCCH-PSSCH-r14 |  | TRUE | |
|  | sizeSubchannel-r14 |  | n50 | n100 |
|  | numSubchannel-r14 |  | n1 | |
|  | startRB-Subchannel-r14 |  | 0 | |
|  | startRB-PSCCH-Pool-r14 |  | not present | |
|  | dataTxParameters-r14 | P0-SL-r12 | -126 | |
|  | zoneID-r14 |  | not present | |
|  | threshS-RSSI-CBR-r14 |  | not present | |
|  | cbr-pssch-TxConfigList-r14 |  | not present | |
|  | resourceSelectionConfigP2X-r14 |  | not present | |
|  | syncAllowed-r14 |  | not present | |
|  | restrictResourceReservationPeriod-r14 |  | not present | |

Table A.9-5: V2X sidelink communication pre-configuration for PSCCH/PSSCH decoding capability test (Configuration #5-V2X)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Information Element | | | Value (20MHz) | |
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 |  | 0 | |
|  | sl-Subframe-r14 | bs20-r14 | 0xFFFFF | |
|  | adjacencyPSCCH-PSSCH-r14 |  | TRUE | |
|  | sizeSubchannel-r14 |  | n10 | n5 |
|  | numSubchannel-r14 |  | n10 | n20 |
|  | startRB-Subchannel-r14 |  | 0 | |
|  | startRB-PSCCH-Pool-r14 |  | not present | |
|  | dataTxParameters-r14 | P0-SL-r12 | -126 | |
|  | zoneID-r14 |  | not present | |
|  | threshS-RSSI-CBR-r14 |  | not present | |
|  | cbr-pssch-TxConfigList-r14 |  | not present | |
|  | resourceSelectionConfigP2X-r14 |  | not present | |
|  | syncAllowed-r14 |  | not present | |
|  | restrictResourceReservationPeriod-r14 |  | not present | |

Table A.9-6: V2X sidelink communication pre-configuration for PSCCH/PSSCH decoding capability test (Configuration #6-V2X)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Information Element | | | Value (10MHz) | |
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 |  | 0 | |
|  | sl-Subframe-r14 | bs20-r14 | 0xFFFFF | |
|  | adjacencyPSCCH-PSSCH-r14 |  | TRUE | |
|  | sizeSubchannel-r14 |  | n10 | n5 |
|  | numSubchannel-r14 |  | n5 | n10 |
|  | startRB-Subchannel-r14 |  | 0 | |
|  | startRB-PSCCH-Pool-r14 |  | not present | |
|  | dataTxParameters-r14 | P0-SL-r12 | -126 | |
|  | zoneID-r14 |  | not present | |
|  | threshS-RSSI-CBR-r14 |  | not present | |
|  | cbr-pssch-TxConfigList-r14 |  | not present | |
|  | resourceSelectionConfigP2X-r14 |  | not present | |
|  | syncAllowed-r14 |  | not present | |
|  | restrictResourceReservationPeriod-r14 |  | not present | |

Annex B (normative):   
Propagation conditions

# B.1 Static propagation condition

## B.1.1 UE Receiver with 2Rx

For 1 port transmission the channel matrix is defined in the frequency domain by

.

For 2 port transmission the channel matrix is defined in the frequency domain by

.

For 4 port transmission the channel matrix is defined in the frequency domain by



For 8 port transmission the channel matrix is defined in the frequency domain by



## B.1.2 UE Receiver with 4Rx

For 1 port transmission the channel matrix is defined in the frequency domain by

.

For 2 port transmission the channel matrix is defined in the frequency domain by

.

For 4 port transmission the channel matrix is defined in the frequency domain by

.

For 8 port transmission the channel matrix is defined in the frequency domain by



## B.1.3 UE Receiver with 8Rx

For 1 port transmission the channel matrix is defined in the frequency domain by

.

For 2 port transmission the channel matrix is defined in the frequency domain by

.

For 4 port transmission the channel matrix is defined in the frequency domain by

.

For 8 port transmission the channel matrix is defined in the frequency domain by



# B.2 Multi-path fading propagation conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.

- A combination of channel model parameters that include the Delay profile and the Doppler spectrum, that is characterized by a classical spectrum shape and a maximum Doppler frequency

- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.

- Additional multi-path models used for CQI (Channel Quality Indication) tests

## B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1 Delay profiles for E-UTRA channel models

|  |  |  |  |
| --- | --- | --- | --- |
| Model | Number of  channel taps | Delay spread  (r.m.s.) | Maximum excess tap delay (span) |
| Extended Pedestrian A (EPA) | 7 | 43 ns | 410 ns |
| Extended Vehicular A model (EVA) | 9 | 357 ns | 2510 ns |
| Extended Typical Urban model (ETU) | 9 | 991 ns | 5000 ns |

Table B.2.1-2 Extended Pedestrian A model (EPA)

|  |  |
| --- | --- |
| Excess tap delay [ns] | Relative power  [dB] |
| 0 | 0.0 |
| 30 | -1.0 |
| 70 | -2.0 |
| 90 | -3.0 |
| 110 | -8.0 |
| 190 | -17.2 |
| 410 | -20.8 |

Table B.2.1-3 Extended Vehicular A model (EVA)

|  |  |
| --- | --- |
| Excess tap delay [ns] | Relative power  [dB] |
| 0 | 0.0 |
| 30 | -1.5 |
| 150 | -1.4 |
| 310 | -3.6 |
| 370 | -0.6 |
| 710 | -9.1 |
| 1090 | -7.0 |
| 1730 | -12.0 |
| 2510 | -16.9 |

Table B.2.1-4 Extended Typical Urban model (ETU)

|  |  |
| --- | --- |
| Excess tap delay [ns] | Relative power  [dB] |
| 0 | -1.0 |
| 50 | -1.0 |
| 120 | -1.0 |
| 200 | 0.0 |
| 230 | 0.0 |
| 500 | 0.0 |
| 1600 | -3.0 |
| 2300 | -5.0 |
| 5000 | -7.0 |

## B.2.2 Combinations of channel model parameters

The propagation conditions used for the performance measurements in multi-path fading environment are indicated as EVA[number], EPA[number] or ETU[number] where ‘number’ indicates the maximum Doppler frequency (Hz).

Table B.2.2-1 Void

## B.2.3 MIMO Channel Correlation Matrices

The MIMO channel correlation matrices defined in B.2.3 apply for the antenna configuration using uniform linear arrays at both eNodeB and UE.

### B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

Table B.2.3.1-1 eNodeB correlation matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | One antenna | Two antennas | Four antennas | Eight antennas |
| eNode B Correlation |  |  |  |  |

Table B.2.3.1-2 defines the correlation matrix for the UE:

Table B.2.3.1-2 UE correlation matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | One antenna | Two antennas | Four antennas | Eight antennas |
| UE Correlation |  |  |  |  |

Table B.2.3.1-3 defines the channel spatial correlation matrix . The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2.3.1-3:  correlation matrices

|  |  |
| --- | --- |
| 1x2 case |  |
| 1x4 case |  |
| 2x1 case |  |
| 2x2 case |  |
| 2x4 case |  |
| 4x1 case |  |
| 4x2 case |  |
| 4x4 case |  |
| 2x8 case |  |
| 4x8 case |  |
| 8x8 case |  |

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of  and  according to.

### B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The  and  for different correlation types are given in Table B.2.3.2-1.

Table B.2.3.2-1: The ** and ** parameters for ULA MIMO correlation matrices

|  |  |  |
| --- | --- | --- |
| Correlation Model | α | β |
| Low correlation | 0 | 0 |
| Medium Correlation | 0.3 | 0.9 |
| Medium Correlation A | 0.3 | 0.3874 |
| Medium Correlation B | 0.3 | 0.005154 |
| High Correlation | 0.9 | 0.9 |

The correlation matrices for high, medium, low and medium A correlation are defined in Table B.2.3.1-2, B.2.3.2-3, B.2.3.2-4 and B.2.3.2-5 as below.

The values in Table B.2.3.2-2 have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:



Where the value “a” is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 2x4 and 4x4 medium correlation matrix in Table B.2.3.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a = 0.00010 and a = 0.00012.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

|  |  |
| --- | --- |
| 1x2 case |  |
| 2x1 case |  |
| 2x2 case |  |
| 4x2 case |  |
| 4x4 case |  |

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

|  |  |
| --- | --- |
| 1x2 case | N/A |
| 2x1 case | N/A |
| 2x2 case |  |
| **2x4 case** |  |
| 4x2 case |  |
| 4x4 case |  |

Table B.2.3.2-4: MIMO correlation matrices for low correlation

|  |  |
| --- | --- |
| 1x2 case |  |
| 1x4 case |  |
| 2x1 case |  |
| 2x2 case |  |
| 2x4 case |  |
| 4x1 case |  |
| 4x2 case |  |
| 4x4 case |  |

In Table B.2.3.2-4, is the identity matrix.

Table B.2.3.2-5: MIMO correlation matrices for medium correlation A

|  |  |
| --- | --- |
| 2x4 case |  |
| 4x4 case |  |

## B.2.3A MIMO Channel Correlation Matrices using cross polarized antennas

The MIMO channel correlation matrices defined in B.2.3A apply for the antenna configuration using cross polarized (XP/X-pol) antennas at both eNodeB and UE. The cross-polarized antenna elements with +/-45 degrees polarization slant angles are deployed at eNB and cross-polarized antenna elements with +90/0 degrees polarization slant angles are deployed at UE.

For the cross-polarized antennas, the N antennas are labelled such that antennas for one polarization are listed from 1 to N/2 and antennas for the other polarization are listed from N/2+1 to N, where N is the number of transmit or receive antennas.

### B.2.3A.1 Definition of MIMO Correlation Matrices using cross polarized antennas

For the channel spatial correlation matrix, the following is used:



where

-  is the spatial correlation matrix at the UE with same polarization,

-  is the spatial correlation matrix at the eNB with same polarization,

-  is a polarization correlation matrix, and

- denotes transpose.

The matrix is defined as



A permutation matrixelements are defined as

.

where  and  is the number of transmitter and receiver respectively. This is used to map the spatial correlation coefficients in accordance with the antenna element labelling system described in B.2.3A.

### B.2.3A.2 Spatial Correlation Matrices using cross polarized antennas at eNB and UE sides

#### B.2.3A.2.1 Spatial Correlation Matrices at eNB side

For 2-antenna transmitter using one pair of cross-polarized antenna elements, .

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, .

For 8-antenna transmitter using four pairs of cross-polarized antenna elements, .

#### B.2.3A.2.2 Spatial Correlation Matrices at UE side

For 2-antenna receiver using one pair of cross-polarized antenna elements, .

For 4-antenna receiver using two pairs of cross-polarized antenna elements, .

B.2.3A.3 MIMO Correlation Matrices using cross polarized antennas

The values for parameters *α*, *β* and *γ* for the cross polarized antenna models are given in Table B.2.3A.3-1.

Table B.2.3A.3-1: : The ** and ** parameters for cross-polarized MIMO correlation matrices

|  |  |  |  |
| --- | --- | --- | --- |
| Correlation Model | α | β |  |
| Medium Correlation A | 0.3 | 0.6 | 0.2 |
| High Correlation | 0.9 | 0.9 | 0.3 |
| Note 1: Value of *α* applies when more than one pair of cross-polarized antenna elements at eNB side.  Note 2: Value of β applies when more than one pair of cross-polarized antenna elements at UE side. | | | |

The correlation matrices for high spatial correlation and medium correlation A are defined in Table B.2.3A.3-2 and Table B.2.3A.3-3 as below.

The values in Table B.2.3A.3-2 have been adjusted to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:



Where the value “a” is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 8x2 high spatial correlation case, a=0.00010.

Table B.2.3A.3-2: MIMO correlation matrices for high spatial correlation

|  |  |
| --- | --- |
| 4x2 case |  |
| 8x2 case |  |

Table B.2.3A.3-3: MIMO correlation matrices for medium correlation A

|  |  |
| --- | --- |
| 4x4 |  |

### B.2.3A.4 Beam steering approach

Given the channel spatial correlation matrix in B.2.3A.1, the corresponding random channel matrix ***H*** can be calculated. The signal model for the k-th subframe is denoted as



Where

- H is the N­rxNtchannel matrix per subcarrier.

-  is the steering matrix,

For 8 transmission antennas, ;

For 4 transmission antennas, .

-  controls the phase variation, and the phase for k-th subframe is denoted by, where is the random start value with the uniform distribution, i.e., ,  is the step of phase variation, which is defined in Table B.2.3A.4-1, and *k* is the linear increment of 1 for every subframe throughout the simulation,

-  is the precoding matrix for Nt transmission antennas,

-  is the received signal,  is the transmitted signal, and is AWGN.

Table B.2.3A.4-1: The step of phase variation

|  |  |
| --- | --- |
| Variation Step | Value (rad/subframe) |
|  | 1.2566×10-3 |

## B.2.3B MIMO Channel Correlation Matrices using two-dimension cross polarized antennas at eNB and cross polarized antennas at UE

The MIMO channel correlation matrices defined in B.2.3B apply for the antenna configuration using two-dimension (2D) cross polarized antennas at eNodeB and the antenna configuration using cross polarized antennas at UE. The cross-polarized antenna elements with +/-45 degrees polarization slant angles are deployed at eNB and cross-polarized antenna elements with +90/0 degrees polarization slant angles are deployed at UE.

For 2D cross-polarized antenna array at eNodeB, the N antennas are indexed by , and total number of antennas is , where

-  is the number of antenna elements in first dimension (i.e. vertical direction) with same polarization,

-  is the number of antenna elements in second dimension (i.e. horizontal direction) with same polarization, and

-  is the number of polarization groups.

For the 2D cross-polarized antennas at eNB, the N antennas are labelled such that antennas shall be in increasing order of the second dimension firstly, then the first dimension, and finally the polarization group. For a specific antenna element at *p*-th polarization, *n1*-th row, and *n2*-th column within the 2D antenna array, the following index number is used for antenna labelling:



where N is the number of transmit antennas, *p* is the polarization group index, *n1* is the row index, and *n2* is the column index of the antenna element.

For the cross-polarized antennas at UE, the N antennas are labelled such that antennas for one polarization are listed from 1 to N/2 and antennas for the other polarization are listed from N/2+1 to N, where N is the number of receive antennas.

### B.2.3B.1 Definition of MIMO Correlation Matrices using two-dimension cross polarized antennas at eNB and cross polarized antennas at UE

For the channel spatial correlation matrix, the following is used:



where

-  is the spatial correlation matrix at the UE with same polarization,

-  is the spatial correlation matrix at the eNB with same polarization,

-  is a polarization correlation matrix, and

- denotes transpose.

The spatial correlation matrix at the eNB is further expressed as following:



where

-  is the correlation matrix of antenna elements in first dimension with same polarization, and

-  is the correlation matrix of antenna elements in second dimension with same polarization.

The matrix  is defined as



A permutation matrix  elements are defined as

.

where  and  is the number of transmitter and receiver respectively. This is used to map the spatial correlation coefficients in accordance with the antenna element labelling system described in B.2.3B.

### B.2.3B.2 Spatial Correlation Matrices using two-dimension cross polarized antennas at eNB and cross polarized antennas at UE

#### B.2.3B.2.1 Spatial Correlation Matrices at eNB side

For one direction of the 2D antenna array at the eNB side, the followings are used to construct the spatial correlation matrix:

For 1 antenna element of the same polarization in one direction, .

For 2 antenna elements of the same polarization in one direction, .

For 3 antenna elements of the same polarization in one direction, .

For 4 antenna elements of the same polarization in one direction, .

where the index  stands for first dimension and second dimension respectively.

#### B.2.3B.2.2 Spatial Correlation Matrices at UE side

For 2-antenna receiver using one pair of cross-polarized antenna elements, .

For 4-antenna receiver using two pairs of cross-polarized antenna elements, .

### B.2.3B.3 MIMO Correlation Matrices using two-dimension cross polarized antennas at eNB and cross polarized antennas at UE

The values for parameters *α1*, *α2*, *β* and *γ* for high and medium spatial correlation are given in Table B.2.3B.3-1.

Table B.2.3B.3-1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Correlation type |  |  |  |  |
| High | 0.9 | 0.9 | 0.9 | 0.3 |
| Medium | 0.3 | 0.3 | 0.6 | 0.2 |
| Note 1: Value of *α1* applies when more than one pair of cross-polarized antenna elements in first dimension at eNB side.  Note 2: Value of *α2* applies when more than one pair of cross-polarized antenna elements in second dimension at eNB side.  Note 3: Value of *β* applies when more than one pair of cross-polarized antenna elements at UE side. | | | | |

The correlation matrices for high spatial correlation with12(2,3,2)x2 case and 16(2,4,2)x2 case are defined in Table B.2.3B.3-2 as below.

The values in Table B.2.3B.3-2 have been adjusted to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:



where the value “a” is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 16(2,4,2)x2 high spatial correlation case, a=0.00012.

The same method is used to adjust the the 24(3,4,2)x2 and 32(4,4,2)x2 high correlation matrix to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a =0.00012 and a=0.00022.

Table B.2.3B.3-2: MIMO correlation matrices for high spatial correlation

|  |  |
| --- | --- |
| 12(2,3,2)x2 case | , where |
| 16(2,4,2)x2 case | , where |

### B.2.3B.4 Beam steering approach

Given the channel spatial correlation matrix in B.2.3B.1, the corresponding random channel matrix ***H*** can be calculated. The signal model for the k-th subframe is denoted as



And the steering matrix is further expressed as following:



where

- H is the N­rxNtchannel matrix per subcarrier.

-  is the steering matrix,

-  is the steering matrix in first dimension with same polarization,

-  is the steering matrix in second dimension with same polarization,

-  is the number of antenna elements infirst dimension with same polarization,

-  is the number of antenna elements in second dimension with same polarization,

For 1 antenna element of the same polarization in one direction, .

For 2 antenna elements of the same polarization in one direction, .

For 3 antenna elements of the same polarization in one direction,.

For 4 antenna elements of the same polarization in one direction, .

where the index  stands for first dimension and second dimension respectively.

-  controls the phase variation in first dimension and second dimension respectively, and the phase for k-th subframe is denoted by, where is the random start value with the uniform distribution, i.e., ,  is the step of phase variation, which is defined in Table B.2.3B.4-1, and *k* is the linear increment of 1 for every subframe throughout the simulation, the index  stands for first dimension and second dimension respectively.

-  is the precoding matrix for Nt transmission antennas,

-  is the received signal,  is the transmitted signal, and is AWGN.

Table B.2.3B.4-1: The step of phase variation

|  |  |
| --- | --- |
| Variation Step | Value (rad/subframe) |
|  | 1.2566×10-3 |

### B.2.3B.4A Beam steering approach with dual cluster beams

Given the channel spatial correlation matrix in B.2.3B.1, the corresponding random channel matrix ***H*** can be calculated. The signal model for the k-th subframe is denoted as



And the steering matrix is further expressed as following:



where

- ,are independent channels for the first beam and second beam with the N­rxNtchannel matrix per subcarrier.

- , are the steering matrix for first beam and second beam

-  is the steering matrix in first dimension with same polarization,

-  is the steering matrix in second dimension with same polarization,

-  is the number of antenna elements infirst dimension with same polarization,

-  is the number of antenna elements in second dimension with same polarization,

-  is the relative power ratio of the second beam to the first beam, the value of is specific to a test case,

For 1 antenna element of the same polarization in one direction, .

For 2 antenna elements of the same polarization in one direction, .

For 3 antenna elements of the same polarization in one direction,.

For 4 antenna elements of the same polarization in one direction, .

where the index  stands for first dimension and second dimension respectively.

-  controls the phase variation in first dimension and second dimension respectively, and the phase for k-th subframe is denoted by, where is the random start value with the uniform distribution, i.e., ,  is the step of phase variation, which is defined in Table B.2.3B.4-1, and *k* is the linear increment of 1 for every subframe throughout the simulation, the index  stands for first dimension and second dimension respectively.

-  is the precoding matrix for Nt transmission antennas,

-  is the received signal,  is the transmitted signal, and is AWGN.

Table B.2.3B.4A-1: The step of phase variation

|  |  |
| --- | --- |
| Variation Step | Value (rad/subframe) |
|  | 1.2566×10-3 |
|  | 2.5132×10-3 |

## B.2.4 Propagation conditions for CQI tests

For Channel Quality Indication (CQI) tests, the following additional multi-path profile is used:

,

in continuous time representation, with  the delay, *a* a constant andthe Doppler frequency. The same *h*(*t*,*τ*) is used to describe the fading channel between every pair of Tx and Rx.

#### B.2.4.1 Propagation conditions for CQI tests with multiple CSI processes

For CQI tests with multiple CSI processes, the following additional multi-path profile is used for 2 port transmission:



Whererepresents Hadamard product, indicates the 2x2 propagation channel generated in the manner defined in Clause B.2.4.

## B.2.5 Void

## B.2.6 MBSFN Propagation Channel Profile

### B.2.6.1 Subcarrier spacing 15kHz or 7.5kHz

Table B.2.6.1-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment.

Table B.2.6.1-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment with subcarrier spacing 15kHz or 7.5kHz

|  |  |
| --- | --- |
| Extended Delay Spread | |
| Maximum Doppler frequency [5Hz] | |
| Relative Delay [ns] | Relative Mean Power [dB] |
| 0 | 0 |
| 30 | -1.5 |
| 150 | -1.4 |
| 310 | -3.6 |
| 370 | -0.6 |
| 1090 | -7.0 |
| 12490 | -10 |
| 12520 | -11.5 |
| 12640 | -11.4 |
| 12800 | -13.6 |
| 12860 | -10.6 |
| 13580 | -17.0 |
| 27490 | -20 |
| 27520 | -21.5 |
| 27640 | -21.4 |
| 27800 | -23.6 |
| 27860 | -20.6 |
| 28580 | -27.0 |

### B.2.6.2 Subcarrier spacing 1.25kHz

Table B.2.6.2-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment for subcarrier spacing as 1.25kHz.

Table B.2.6.2-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment with subcarrier spacing 1.25kHz

|  |  |
| --- | --- |
| Extended Delay Spread | |
| Maximum Doppler frequency [5Hz] | |
| Relative Delay [ns] | Relative Mean Power [dB] |
| 0 | 0 |
| 30 | -1.5 |
| 150 | -1.4 |
| 310 | -3.6 |
| 370 | -0.6 |
| 1090 | -7.0 |
| 49960 | -10 |
| 49990 | -11.5 |
| 50110 | -11.4 |
| 50270 | -13.6 |
| 50330 | -10.6 |
| 51050 | -17.0 |
| 109960 | -20 |
| 109990 | -21.5 |
| 110110 | -21.4 |
| 110270 | -23.6 |
| 110330 | -20.6 |
| 111050 | -27.0 |

### B.2.6.3 Subcarrier spacing 0.37kHz

Table B.2.6.3-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment for subcarrier spacing as 0.37kHz.

Table B.2.6.3-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment with subcarrier spacing 0.37kHz

|  |  |
| --- | --- |
| Extended Delay Spread | |
| Zero Doppler frequency | |
| Relative Delay [μs] | Relative Mean Power [dB] |
| 0 | -11 |
| 130 | -10 |
| 220 | -4.5 |
| 240 | -3.5 |
| 400 | 0 |
| 520 | -13 |
| 650 | -20 |
| 800 | -25 |

### B.2.6.4 Subcarrier spacing 2.5kHz

Table B.2.6.4-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment for subcarrier spacing as 2.5kHz.

Table B.2.6.4-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment with subcarrier spacing 2.5kHz

|  |  |
| --- | --- |
| Extended Delay Spread | |
| Maximum Doppler frequency [162Hz] | |
| Relative Delay [ns] | Relative Mean Power [dB] |
| -310 | -3.6 |
| -280 | -1.5 |
| -160 | -1.4 |
| 0 | 0 |
| 60 | -0.6 |
| 780 | -7.0 |
| 49650 | -10 |
| 49680 | -11.5 |
| 49800 | -11.4 |
| 49960 | -13.6 |
| 50020 | -10.6 |
| 50740 | -17.0 |
| 109650 | -20 |
| 109680 | -21.5 |
| 109800 | -21.4 |
| 109960 | -23.6 |
| 110020 | -20.6 |
| 110740 | -27.0 |

# B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

 (B.3.1)

where  is the Doppler shift and  is the maximum Doppler frequency. The cosine of angle is given by

,  (B.3.2)

,  (B.3.3)

,  (B.3.4)

where  is the initial distance of the train from eNodeB, and  is eNodeB Railway track distance, both in meters;  is the velocity of the train in m/s,  is time in seconds.

Doppler shift and cosine angle are given by equation B.3.1 and B.3.2-B.3.4 respectively, where the required input parameters listed in table B.3-1 and the resulting Doppler shift shown in Figure B.3-1 are applied for all frequency bands.

Table B.3-1: High speed train scenario

|  |  |
| --- | --- |
| Parameter | Value |
|  | 300 m |
|  | 2 m |
|  | 300 km/h |
|  | 750 Hz |

NOTE 1: Parameters for HST conditions in table B.3-1 including  and Doppler shift trajectories presented on figure B.3-1 were derived from Band 7 and are applied for performance verification in all frequency bands.



Figure B.3-1: Doppler shift trajectory

For 1x2 antenna configuration, the same *h*(*t*,*τ*) is used to describe the channel between every pair of Tx and Rx.

For 2x2 antenna configuration, the same *h*(*t*,*τ*) is used to describe the channel between every pair of Tx and Rx with phase shift according to .

# B.3A HST-SFN scenario

There is an infinite number of RRHs distributed equidistantly along the track with the same Cell ID as depicted in figure B.3A-1.



Figure B.3A-1: Deployment of HST-SFN

The location of RRH *k* is given as:

 (B.3A.1)

where: ,  and is the distance between the RRHs and railway track, while  is the distance of two RRHs, both in meters.

The train location is denoted as:

 (B.3A.2)

where:  and *a* means distance in meters, which means the train is right on the track.

The HST-SFN scenario for the test of the baseband performance is a non fading propagation channel with four taps, namely the four nearest RRHs. Thus RRH *k* is visible for the train only in the range:

 (B.3A.3)

Power level  (dB) for the signal from *k*th RRH, normalized to the total power received from all visible RRHs, is given by:

 for  (B.3A.4)

Doppler shift (Hz) from *k*th RRH is given by:

 for  (B.3A.5)

The relative delay  (s) for the signal from *k*th RRH can be derived as:

 for  (B.3A.6)

In the above *v* (m/s) is the moving speed of the train, *f*C (Hz) is the center frequency, and *C* (m/s) is the velocity of light.

Power level, Doppler shift and relative delay are given by equations B.3A.4 ~ B.3A.6 respectively, where the required input parameters listed in table B.3A-1 and the resulting Doppler shift shown in Figure B.3A-3 are applied for all frequency bands.

Table B.3A-1: HST-SFN scenario

|  |  |
| --- | --- |
| Parameter | Value |
|  | 1000 m |
|  | 50m |
|  | 350 km/h |
|  | 872 Hz |

NOTE 1: Parameters for HST-SFN scenario in Table B.3A-1 includingand Doppler shift trajectories presented in Figure B.3A-2 were derived from Band 7 and are applied for performance verification in all frequency bands. And the trajectories of ralative power, Doppler shifts and relative delay presented in Figures B.3A-2~ B.3A-4 are derived from the equations B.3A.4 ~ B.3A.6 respectively.



Figure B.3A-2 Ralative power level trajectories

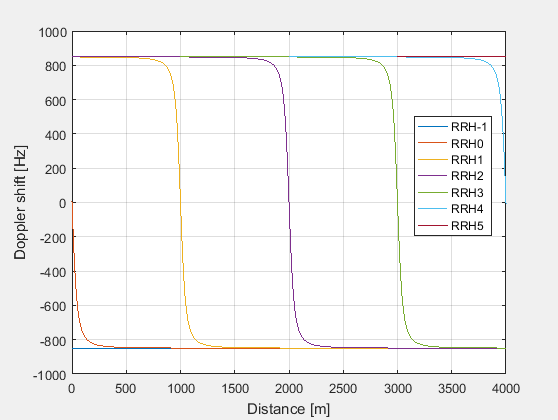


Figure B.3A-3 Doppler shifts trajectories

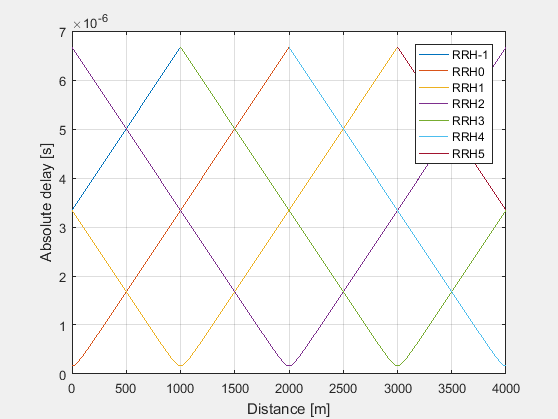


Figure B.3A-4 Relative delay trajectories

For 2x2 antenna configuration, the same *h*(*t*,*τ*) is used to describe the channel between every pair of Tx and Rx with phase shift according to .

For 2x4 antenna configuration, the same *h*(*t*,*τ*) is used to describe the channel between every pair of Tx and Rx with phase shift according to .

# B.3B HST-SFN scenario for 500 km/h speed

The channel model for this scenario is the same as B.3A, with the following parameters replacing Table B.3A-1:

Table B.3B-1-500: HST-SFN scenario for higher speed

|  |  |
| --- | --- |
| Parameter | Value |
|  | 1000 m |
|  | 50 m |
|  | 500 km/h |
|  | 972 Hz |

# B.3C HST scenario for 500 km/h speed

The channel model for this scenario is the same as B.3, with the following parameters replacing Table B.3-1:

Table B.3C-1: HST-500 scenario for higher speed

|  |  |
| --- | --- |
| Parameter | Value |
|  | 300 m |
|  | 2 m |
|  | 500 km/h |
|  | 972 Hz |

# B.4 Beamforming Model

## B.4.1 Single-layer random beamforming (Antenna port 5, 7, or 8)

Single-layer transmission on antenna port 5 or on antenna port 7 or 8 without a simultaneous transmission on the other antenna port, is defined by using a precoder vector  of size  or  randomly selected with the number of layers  from Table 6.3.4.2.3-1 or Table 6.3.4.2.3-2 in [4] as beamforming weights. This precoder takes as an input the signal, , for antenna port , with  the number of modulation symbols including the user-specific reference symbols (DRS), and generates a block of signals  the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:



Single-layer transmission on antenna port 7 or 8 with a simultaneous transmission on the other antenna port, is defined by using a pair of precoder vectors  and  each of size  or , which are not identical and randomly selected with the number of layers  from Table 6.3.4.2.3-1 or Table 6.3.4.2.3-2 in [4], as beamforming weights, and normalizing the transmit power as follows:



The precoder update granularity is specific to a test case.

The CSI reference symbols  satisfying , , are transmitted on the same physical antenna element as the modulation symbols . The CSI reference symbols  satisfying , , are transmitted on the same physical antenna element as the modulation symbols .

## B.4.1A Single-layer random beamforming (Antenna port 7, 8, 11 or 13 with enhanced DMRS table configured)

Single-layer transmission on antenna port 11 with a simultaneous transmission on one antenna port from antenna port 7,8 or 13, is defined by using a pair of precoder vectors  and  each of size , which are not identical and randomly selected with the number of layers  from Table 6.3.4.2.3-1 in [4], as beamforming weights, and normalizing the transmit power as follows:



The precoders takes and as the input the signals, , with  the number of modulation symbols including the user-specific reference symbols (DM-RS), and generates a block of signals  the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements.

The antenna port  update granularity is specific to a test case.

The precoder update granularity is specific to a test case.

The CSI reference symbols  satisfying, , are transmitted on the same physical antenna element as the modulation symbols . The CSI reference symbols  satisfying, , are transmitted on the same physical antenna element as the modulation symbols .

## B.4.2 Dual-layer random beamforming (antenna ports 7 and 8)

Dual-layer transmission on antenna ports 7 and 8 is defined by using a precoder matrix ** of size  randomly selected with the number of layers  from Table 6.3.4.2.3-1 in [4] as beamforming weights. This precoder takes as an input a block of signals for antenna ports 7 and 8, , , with  being the number of modulation symbols per antenna port including the user-specific reference symbols, and generates a block of signals the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

,

The precoder update granularity is specific to a test case.

The CSI reference symbols  satisfying , , are transmitted on the same physical antenna element as the modulation symbols . The CSI reference symbols  satisfying , , are transmitted on the same physical antenna element as the modulation symbols .

## B.4.3 Generic beamforming model (antenna ports 7-14)

The transmission on antenna port(s)  is defined by using a precoder matrix  of size , where is the number of CSI reference signals configured per test and  is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) , , , with  being the number of modulation symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals  the elements of which are to be mapped onto the same time-frequency index pair  but transmitted on different physical antenna elements:



The precoder matrix is specific to a test case.

The physical antenna elements are identified by indices , where  is the number of physical antenna elements configured per test.

Modulation symbols  with  (i.e. beamformed PDSCH and DM-RS) are mapped to the physical antenna index .

Modulation symbols  with  (i.e. PBCH, PDCCH, PHICH, PCFICH) are mapped to the physical antenna index , where  is the number of cell-specific reference signals configured per test.

Modulation symbols  with (i.e. CRS) are mapped to the physical antenna index , where  is the number of cell-specific reference signals configured per test.

Modulation symbols  with  (i.e. CSI-RS) are mapped to the physical antenna index , where is the number of CSI reference signals configured per test.

## B.4.4 Random beamforming for EPDCCH distributed transmission (Antenna port 107 and 109)

EPDCCH distributed transmission on antenna port 107 and antenna port 109 is defined by using a pair of precoder vectors  and  each of size , which are not identical and randomly selected per EPDCCH PRB pair with the number of layers  from Table 6.3.4.2.3-1 in [4], as beamforming weights. This precoder takes as an input the signal, , for antenna port , with  the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals . When EPDCCH is associated with port 107, the transmitted block of signals is deonted as

.

When EPDCCH is associated with port 109, the transmitted block of signals is denoted as

.

## B.4.5 Random beamforming for EPDCCH localized transmission (Antenna port 107, 108, 109 or 110)

EPDCCH localized transmission on antenna port 107, 108, 109 or 110 is defined by using a precoder vector  of size 2×1 randomly selected with the number of layers  from Table 6.3.4.2.3-1 in [4] as beamforming weights. This precoder takes as an input the signal,, for antenna port , with  the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals  the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

.

## B.4.6 Beamforming model for CRI test

The transmission on antenna port(s)  is defined by using a precoder matrix  of size , where is the number of CSI reference signals configured per test and  is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) , , , with  being the number of modulation symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals  the elements of which are to be mapped onto the same time-frequency index pair  but transmitted on different physical antenna elements:



- is precoder matrix

-  is amplitude scaling factor for CRI test,

-  is power scaling factor as following definition:

● , A = 5 dB, B = -1.3351 dB.

●  controls the phase variation, and the phase for m-th subframe is denoted by, where is the random start value with the uniform distribution, i.e., ,  is the step of phase variation which is defined in Table B.4.6-1, and m is the linear increment of 1 for every sub-frame throughout the simulation.

● K is the number of configured CSI-RS resources

● 

- For following CRI with multiple CSI-RS resources configured, equals to CRI value reported by UE

- For fixed CRI with single CSI-RS resource configure, equals to 0.

Table B.4.6-1: The step of phase variation

|  |  |
| --- | --- |
| Variation Step | Value (rad/subframe) |
|  | 1.2566×10-3 |

The physical antenna elements are identified by indices, where  is the number of physical antenna elements configured per test.

Modulation symbols  with  (i.e. beamformed PDSCH and DM-RS) are mapped to the physical antenna index.

For the k-th configured CSI-RS resource, modulation symbols  with  (i.e. CSI-RS) are firstly multipled by amplitude scaling factor  to generate power scaled symols :



- equals to CSI-RS resource index (k-th)

And power scaled symols with  (i.e. power scaled CSI-RS) are mapped to the physical antenna index, where is the number of CSI reference signals configured per test.

Modulation symbols  with  (i.e. PBCH, PDCCH, PHICH, PCFICH) are mapped to the physical antenna index , where  is the number of cell-specific reference signals configured per test.

Modulation symbols  with (i.e. CRS) are mapped to the physical antenna index , where  is the number of cell-specific reference signals configured per test.

# B.5 Interference models for enhanced performance requirements Type-A

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-A including: definition of dominant interferer proportion, transmission mode 3, 4 and 9 type of interference modelling.

## B.5.1 Dominant interferer proportion

Each interfering cell involved in enhanced performance requirements Type-A is characterized by its associated dominant interferer proportion (DIP) value:



where is  is the average received power spectral density from the i-th strongest interfering cell involved in the requirement scenario (is assumed to be the power spectral density associated with the serving cell) and  where  is the average power spectral density of a white noise source consistent with the definition provided in subclause 3.2 and  is the total number of cells involved in a given requirement scenario.

## B.5.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [6], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For rank-1 transmission over a subband, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4].

For rank-2 transmission over a subband, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [4].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.5.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth according to the probabilities of occurrence. Transmitted physical channels shall include PSS, SSS and PBCH. Probabilites of occurrence in each subframe are as specified in the requirement scenario. If the probabilities of occurrence in each subframe are not specified in the requirement scenario, as default, they are equal to 1.

For each subframe and each CQI subband as defined in subclause 7.2 of [6], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and CQI subband, a precoding matrix for the number of layers  associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [4]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is .

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [4] with the selected precoding matrices for each subframe and each CQI subband.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.5.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth according to the probabilities of occurrence. Transmitted physical channels shall include PSS, SSS and PBCH. Probabilites of occurrence in each subframe are as specified in the requirement scenario. If the probabilities of occurrence in each subframe are not specified in the requirement scenario, as default, they are equal to 1.

For each subframe and each CQI subband as defined in subclause 7.2 of [6], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and each CQI subband, a precoding matrix for the number of layers  associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-2 of [4].

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe and each CQI subband shall be applied to 16QAM randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

# B.6 Interference models for enhanced performance requirements Type-B

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-B including: transmission mode 2, 3, 4 and 9 type of interference modelling and a definition of the random interference model.

## B.6.1 Transmission mode 2 interference model

This subclause provides transmission mode 2 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

Precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined for each user defined in section B.6.6 with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For rank-1 transmission, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4].

For rank-2 transmission, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [4].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For each TTI, for each user defined in B.6.6, a single precoding matrix for the number of layers  associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [4]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is .

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [4] with the selected precoding matrices as specified in subclause B.6.6.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For each TTI, for each user defined in B.6.6, a single precoding matrix for the number of layers  associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [4]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is .

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe shall be applied to randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For each TTI, for each user defined in B.6.6, the scrambling ID value nSCID is randomly assigned from the set of {0,1}.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.5 CRS interference model

This subclause provides for the CRS interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe there is no PDSCH transmitted. Transmitted physical channels shall include PSS, SSS and PBCH.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.6 Random interference model

This subclause presents the interference model which defines the resource allocation, MCS and rank for the two interference cells. The model includes approximately 10% DTX on these interference cells. Table B.6.6-1 shows the resource allocation for four users in two different configurations for each of the two interferers. Table B.6.6-2 shows the resource allocation to be used for special subframes with TM9 interference. Table B.6.6-3 shows the probabilities for the MSC and rank for these users.

Table B.6.6-1: Resource allocation for the random interference model

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Resource allocation configurations Indexes | User Index | Resource allocation for random interference model | | | | Probability |
| Resource allocation type | Bitmap for resource allocation (Note 1) | | |
| 1st field bitmap | 2nd field bitmap | 3rd field bitmap |
| Configuration 1 | User 0 | 1 | 00 | 0 | 10101000101010 | 50% |
| User 1 | 1 | 00 | 0 | 01010101010101 |
| User 2 | 0 | 01001001001001001 | | |
| User 3 | 0 | 00100100100100100 | | |
| Configuration 2 | User 0 | 1 | 00 | 0 | 10101010101010 | 50% |
| User 1 | 1 | 00 | 1 | 01010100010101 |
| User 2 | 0 | 01001001001001001 | | |
| User 3 | 0 | 00100100100100100 | | |
| Note 1: The 1st, 2nd, and 3rd field bitmaps are only valid for resource allocation type 1 which was defined in [6].  Note 2: The resource allocation model is used for both 1st and 2nd interfering cells and the resource allocation is independent for each interfering cell. | | | | | | |

Table B.6.6-2: Resource allocation for the random interference model for TM9 special subframes

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Resource allocation configurations Indexes | User Index | Resource allocation for random interference model | | | | Probability |
| Resource allocation type | Bitmap for resource allocation (Note 1) | | |
| 1st field bitmap | 2nd field bitmap | 3rd field bitmap |
| Configuration 1 | User 0 | 1 | 00 | 0 | 10101000101010 | 50% |
| User 1 | 1 | 00 | 0 | 01010101000001 |
| User 2 | 0 | 01001000001001001 | | |
| User 3 | 0 | 00100100000100100 | | |
| Configuration 2 | User 0 | 1 | 00 | 0 | 10101000101010 | 50% |
| User 1 | 1 | 00 | 1 | 01010000010101 |
| User 2 | 0 | 01001000001001001 | | |
| User 3 | 0 | 00100100000100100 | | |
| Note 1: The 1st, 2nd, and 3rd field bitmaps are only valid for resource allocation type 1 which was defined in [6].  Note 2: The resource allocation model is used for both 1st and 2nd interfering cells and the resource allocation is independent for each interfering cell. | | | | | | |

Table B.6.6-3 MCS and rank configuration for the random interference model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MCS probability | | | Rank probability | |
| MCS5 | MCS14 | MCS25 | Rank 1 | Rank 2 |
| 50% | 25% | 25% | 80% | 20% |
| Note 1: The MCS and rank should follow the probability indicated in the table randomly per UE per TTI.  Note 2: The probabilities for MCS and rank configuration are used for both 1st and 2nd interfering cells. The MCS and rank configurations are independent for each interfering cell. | | | | |

# B.7 Interference models for enhanced downlink control channel performance requirements Type A and B

This clause provides a description for the modelling of interfering cell transmissions for the enhanced downlink control channel performance requirements Type A and B.

## B.7.1 PDCCH, PCFICH and PHICH interference model

This subclause provides a description of the interfering cell transmissions model for the enhanced PDCCH/PCFICH and PHICH downlink control channel performance requirements Type A and B under synchronous network scenarios.

The transmitted physical signals and channels shall include CRS, PSS, SSS, PBCH and PCFICH. The PDCCH and PHICH transmit signals are emulated as virtual PDCCH signals described further in the clause.

The PDCCH signals are modelled with a per control channel element (CCE) level granularity and have guaranteed 50% CCE resource loading in each subframe. For each subframe the set of active and inactive CCEs is derived in accordance to the following procedure:

1) All available CCEs for the PDCCH and PHICH are marked as CCE0, CCE1, …, CCEN-1.

2) For the given partial loading ratio X = 50% the numbers of active CCEs *MActive* and inactive CCEs *MInactive* are derived



3) The indexes of *MInactive* inactive CCEs are randomly selected out of the full set of CCEs.

4) The remaining *MActive* CCEs are assigned to be active.

No signals are transmitted in the REs corresponding to the inactive CCEs. The PDCCH signals are transmitted in the REs corresponding to the active CCEs. For PDCCH REs, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio of the PDCCH REs in the active CCEs shall be derived in accordance to the following procedure:

1) For each generated active i-th CCE the PDCCH power boosting level  shall be randomly generated using the uniform distribution in the [Pmin, Pmax] range. The Pmin is equal to -6 dB, the Pmax is equal to 6 dB. The random values should be derived in the dB scale.

2) Additional power normalization is applied for each generated i-th PDCCH power boosting level:



where  and  are the PDCCH power boosting coefficients before and after normalization in the dB scale; the power normalization factor α is equal to 1.3 dB.

3) The normalized PDCCH power boosting coefficients  are further applied to the PDCCH\_RA and PDCCH\_RB values to derive the EPRE ratio of the PDCCH signals transmitted in the REs corresponding the i-th CCE in each subframe.

# B.8 Burst transmission models for Frame structure type 3

This clause provides a description for burst transmission models for Frame structure type 3.

## B.8.1 Burst transmission model for one LAA SCell

One burst is defined as downlink transmissions which occupy one or more consecutive subframes. The burst transmission format is determined according to the steps below:

1) Select the number of subframes randomly from a given set of the number of subframes with equal probability as the total length of burst transmission format. The length includes both occupied OFDM symbols and non-occupied OFDM symbols within the burst format. is given per test case.

2) If is equal to 1, the subframe is set as fully occupied, otherwise:

- For demodulation test, the starting position for the first subframe is randomly selected from OFDM symbol 0 and OFDM symbol 7 with equal probability. For CSI test, the starting position for the first subframe is OFDM symbol 0.

- The configuration of occupied OFDM symbols in the last subframe is randomly selected from configuration set . is given per test case.

A uniform random variable from [0, 1] is generated. If the random variable is less than *p* which is given per test case,

- If both the last subframe of previous burst and first subframe of new burst format are fully occupied, start burst transmission after deferring one subframe from the last subframe of previous burst. Otherwise, start burst transmission at the end of last subframe of previous burst.

Otherwise, the burst transmission is muted and the muting duration is the same as the number of subframes for determined burst format.

## B.8.2 Burst transmission model for multiple LAA SCell(s)

This clause provides a description for burst transmission models for Frame structure type 3 when there are multiple LAA Scell(s) in the test.

One burst is defined as downlink transmissions which occupy one or more consecutive subframes. Assuming M carriers are configured, the burst transmission format is determined according to the steps below:

1) For each carrier *cm* (*m*=0,⋯, M-1), select the number of subframes *Nm* randomly from a given set of the number of subframes *S1* with equal probability as the total length of burst transmission format used for carrier *cm*. The length includes both occupied OFDM symbols and non-occupied OFDM symbols within the burst format. *S1* is given per test case.

2) If any *Nm* is equal to 1, the first subframe is set as fully occupied for all carriers, otherwise:

- For demodulation test, the starting position for the first subframe is randomly selected from OFDM symbol 0 and OFDM symbol 7 with equal probability. For CSI test, the starting position for the first subframe is OFDM symbol 0. The starting position is common for all carriers.

- The configuration of occupied OFDM symbols in the last subframe is randomly selected from configuration set *S2* for each carrier *cm*. *S2* is given per test case.

A uniform random variable *pm* from [0, 1] is generated for each carrier *cm* to determine whether the burst is transmitted or not on each carrier.

For each carrier *cm*, if *pm* is less than *p* which is given per test case,

- If both the last subframe of previous longest transmitted burst over M carriers and first subframe of new burst format are fully occupied, start burst transmission according to the determined burst transmission format for thiscarrierafter deferring one subframe from the last subframe of previous longest transmitted burst. Otherwise, start burst transmission for this carrierat the end of last subframe of previous longest transmitted burst

Otherwise, the burst transmission is muted and the muting duration is *Nmax* and *Nmax* is the maximum of *Nj* wherein *j*∈{0,1,⋯,M-1} and *pj* is less than *p*.

Annex C (normative):   
Downlink Physical Channels

# C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

# C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

Table C.2-1: Downlink Physical Channels required  
for connection set-up

|  |
| --- |
| Physical Channel |
| PBCH |
| SSS |
| PSS |
| PCFICH |
| PDCCH |
| EPDCCH |
| PHICH |
| PDSCH |

# C.3 Connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

## C.3.1 Measurement of Receiver Characteristics

Unless otherwise stated, Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7).

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

|  |  |
| --- | --- |
| Physical Channel | EPRE Ratio |
| PBCH | PBCH\_RA = 0 dB |
| PBCH\_RB = 0 dB |
| PSS | PSS\_RA = 0 dB |
| SSS | SSS\_RA = 0 dB |
| PCFICH | PCFICH\_RB = 0 dB |
| PDCCH | PDCCH\_RA = 0 dB |
| PDCCH\_RB = 0 dB |
| PDSCH | PDSCH\_RA = 0 dB |
| PDSCH\_RB = 0 dB |
| OCNG | OCNG\_RA = 0 dB |
| OCNG\_RB = 0 dB |

NOTE 1: No boosting is applied.

For measurements on cells in TDD Band 46, Table C.3.1-1a is applicable for measurements of Receiver Characteristics (clause 7).

**Table C.3.1-1a: Downlink Physical Channels transmitted during a connection (TDD Band 46)**

|  |  |
| --- | --- |
| Physical Channel | EPRE Ratio |
| DRS | NOTE 1 |
| PSS | PSS\_RA = 0 dB |
| SSS | SSS\_RA = 0 dB |
| PCFICH | PCFICH\_RB = 0 dB |
| PDCCH | PDCCH\_RA = 0 dB |
| PDCCH\_RB = 0 dB |
| PDSCH | PDSCH\_RA = 0 dB |
| PDSCH\_RB = 0 dB |
| OCNG | OCNG\_RA = 0 dB |
| OCNG\_RB = 0 dB |
| NOTE 1: No boosting is applied. | |

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Note |
| Transmitted power spectral density | dBm/15 kHz | Test specific | 1. shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio |  | 0 dB |  |

## C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels, unless otherwise stated.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD and Frame structure Type 3)

|  |  |
| --- | --- |
| Physical Channel | EPRE Ratio |
| PBCH | PBCH\_RA = A+ σ |
| PBCH\_RB = B+ σ |
| PSS | PSS\_RA = 0 (Note 3) |
| SSS | SSS\_RA = 0 (Note 3) |
| PCFICH | PCFICH\_RB = B+ σ |
| PDCCH | PDCCH\_RA = A+ σ |
| PDCCH\_RB = B+ σ |
| EPDCCH | EPDCCH\_RA = A+δ |
| EPDCCH\_RB = B+δ |
| MPDCCH | MPDCCH\_RA = A+δ |
| MPDCCH\_RB = B+δ |
| SPDCCH (CRS-based) | SPDCCH\_RA = A+σ |
| SPDCCH\_RB = B+σ |
| SPDCCH (DMRS-based) | SPDCCH\_RA = A+δ |
| SPDCCH\_RB = B+δ |
| PDSCH | PDSCH\_RA = A |
| PDSCH\_RB = B |
| PMCH | PMCH\_RA = A |
| PMCH\_RB = B |
| MBSFN RS | MBSFN RS\_RA = A |
| MBSFN RS\_RB = B |
| OCNG | OCNG\_RA = A+ σ |
| OCNG\_RB = B+ σ |

NOTE 1: A= B = 0 dB means no RS boosting.

NOTE 2: MBSFN RS and OCNG are not defined downlink physical channels in [4].

NOTE 3: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 4: A, B, σ, and δ are test specific.

NOTE 5: Void.

NOTE 6: For Frame Structure Type 3, PBCH are not defined.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Note |
| Total transmitted power spectral density | dBm/15 kHz | Test specific | 1. shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio |  | Test specific | 1. Applies for antenna port *p* |
| Energy per resource element EPRE |  | Test specific | 1. The complex-valued symbols  and defined in [4] shall conform to the given EPRE value.  2. For TM8, TM9 and TM10 the reference point for EPRE is before the precoder in Annex B.4. |

## C.3.3 Aggressor cell power allocation for Measurement of Performance Requirements when ABS is Configured

For the performance requirements and channel state information reporting when ABS is configured, the power allocation for the physical channels of the aggressor cell in non-ABS and ABS is listed in Table C.3.3-1.

Table C.3.3-1: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Physical Channel | Parameters | Unit | EPRE Ratio | |
|  | Non-ABS | ABS |
| PBCH | PBCH\_RA | dB | A | Note 1 |
| PBCH\_RB | dB | B | Note 1 |
| PSS | PSS\_RA | dB | A | Note 1 |
| SSS | SSS\_RA | dB | A | Note 1 |
| PCFICH | PCFICH\_RB | dB | B | Note 1 |
| PHICH | PHICH\_RA | dB | A | Note 1 |
| PHICH\_RB | dB | B | Note 1 |
| PDCCH | PDCCH\_RA | dB | A | Note 1 |
| PDCCH\_RB | dB | B | Note 1 |
| PDSCH | PDSCH\_RA | dB | N/A | Note 1 |
| PDSCH\_RB | dB | N/A | Note 1 |
| OCNG | OCNG\_RA | dB | A | Note 1 |
| OCNG\_RB | dB | B | Note 1 |
| Note 1: -∞ dB is allocated for this channel in this test. | | | | |

Table C.3.3-2: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell when the CRS assistance information is provided

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Physical Channel | Parameters | Unit | EPRE Ratio | |
| Non-ABS | ABS |
| PBCH | PBCH\_RA | dB | A | A |
| PBCH\_RB | dB | B | B |
| PSS | PSS\_RA | dB | A | A |
| SSS | SSS\_RA | dB | A | A |
| PCFICH | PCFICH\_RB | dB | B | Note 1 |
| PHICH | PHICH\_RA | dB | A | Note 1 |
| PHICH\_RB | dB | B | Note 1 |
| PDCCH | PDCCH\_RA | dB | A | Note 1 |
| PDCCH\_RB | dB | B | Note 1 |
| PDSCH | PDSCH\_RA | dB | N/A | Note 1 |
| PDSCH\_RB | dB | N/A | Note 1 |
| OCNG | OCNG\_RA | dB | A | Note 1 |
| OCNG\_RB | dB | B | Note 1 |
| Note 1: -∞ dB is allocated for this channel in this test. | | | | |

## C.3.4 Power Allocation for Measurement of Performance Requirements when Quasi Co-location Type B: same Cell ID

For the performance requirements related to quasi-colocation type B behaviour when transmission points share the same Cell ID, the power allocation for the physical channels of the serving cell is listed in Table C.3.4-1 and the power allocation for the physical channels of the cell transmitting PDSCH is listed in Table C.3.4-2

Table C.3.4-1: Downlink physical channels transmitted in the serving cell (TP1)

|  |  |
| --- | --- |
| Physical Channel | EPRE Ratio |
| PBCH | PBCH\_RA = A+ σ |
| PBCH\_RB = B+ σ |
| PSS | PSS\_RA = 0 (Note 2) |
| SSS | SSS\_RA = 0 (Note 2) |
| PDSCH | PDSCH\_RA = A |
| PDSCH\_RB = B |
| PCFICH | PCFICH\_RB = B+ σ |
| PDCCH | PDCCH\_RA = A+ σ |
| PDCCH\_RB = B+ σ |

NOTE 1: A= B = 0 dB means no RS boosting.

NOTE 2: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 3: A, B and σ are test specific.

Table C.3.4-2: Downlink physical channels for the transmission point transmitting PDSCH (TP2)

|  |  |
| --- | --- |
| Physical Channel | Value |
| PDSCH | Test Specific |

## C.3.5 Simplified CA testing method

For CA tests which require more than 16 independent faders, if a test system cannot support a throughput measurement with fading on all carriers simultaneously, the simplified CA testing method shall be used.

In the simplified CA testing method, the resulting propagation channel(s) shall be generated by considering a number of independent faders needed for one carrier and connecting them to the signal of randomly chosen carrier(s). The maximum number of channel faders on the test will be less than or equal to 16. The remaining carrier(s) shall be connected without a channel fader but with AWGN. The throughput is then collected only for the carrier(s) connected to channel faders.

In the simplified CA testing method, the test shall be repeated by choosing carrier(s) excluding already chosen carrier(s) until all the carrier(s) are tested under fading conditions. All the collected throughtputs from each carrier shall be compared against the reference value of the requirements.

All supported carriers shall be configured and activated during the test.

## C.3.6 Measurement of Receiver Characteristics for Narrowband IoT

For the performance requiremens for Narrowband IoT, the power allocation for the physical channels is listed in Table C.3.6-1

Table C.3.6-1: Downlink Physical Channels transmitted during a connection

|  |  |  |
| --- | --- | --- |
| Physical Channel | EPRE Ratio for one NRS antenna port | EPRE Ratio for two NRS antenna ports |
| NPBCH | 0 dB | -3 dB |
| NPDCCH | 0 dB | -3 dB |
| NPDSCH | 0 dB | -3 dB |
| NPSS | 0 dB | 0 dB |
| NSSS | 0 dB | 0 dB |

NOTE 1: Assuming NPSS and NSSS transmitted on one NRS antenna port.

Table C.3.6-2: Power allocation for OFDM symbols and reference signals

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Note |
| Transmitted power spectral density | dBm/15 kHz | Test specific | shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio |  | 0 dB | Applicble for In-band operation |
| Narrowband reference signal power ratio |  | 0 dB | Applicble for Stand-alone and Guard-band operation |
| Narrowband refefence signal power over cell-specific reference signal power |  | 0 dB | Applicable for In-band operation |

Annex D (normative):   
Characteristics of the interfering signal

# D.1 General

Unless otherwise stated, when the channel bandwidth is wider or equal to 5MHz, a modulated 5MHz full bandwidth E-UTRA downlink signal and CW signal are used as interfering signals when RF performance requirements for E-UTRA UE receiver are defined. For channel bandwidths below 5MHz, the bandwidth of modulated interferer should be equal to bandwidth of the received signal.

For Band 46, the bandwidth of interfering signal is 20MHz when RF performance requirements for E-UTRA UE receiver are defined.

# D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel bandwidth options.

Table D.2-1: Description of modulated E-UTRA interferer

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Channel bandwidth | | | | | |
| 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| BWInterferer | 1.4 MHz | 3 MHz | 5 MHz | 5 MHz | 5 MHz | 5 MHz |
| RB | 6 | 15 | 25 | 25 | 25 | 25 |

Table D.2-2 describes the modulated interferer setting 2 for different channel bandwidth options for Band 46.

Table D.2-2: Description of modulated E-UTRA interferer for Band 46

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Channel bandwidth | | | | | |
| 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| BWInterferer |  |  |  |  |  | 20 MHz |
| RB |  |  |  |  |  | 100 |

Annex E (normative):   
Environmental conditions

# E.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

# E.2 Environmental

The requirements in this clause apply to all types of UE(s).

## E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1

|  |  |
| --- | --- |
| +15°C to +35°C | for normal conditions (with relative humidity of 25 % to 75 %) |
| -10°C to +55°C | for extreme conditions (see IEC publications 68‑2‑1 and 68‑2‑2) |

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

## E.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table E.2.2-1

|  |  |  |  |
| --- | --- | --- | --- |
| Power source | Lower extreme  voltage | Higher extreme  voltage | Normal conditions  voltage |
| AC mains | 0,9 \* nominal | 1,1 \* nominal | nominal |
| Regulated lead acid battery | 0,9 \* nominal | 1,3 \* nominal | 1,1 \* nominal |
| Non regulated batteries:  Leclanché  Lithium  Mercury/nickel & cadmium | 0,85 \* nominal  0,95 \* nominal  0,90 \* nominal | Nominal  1,1 \* Nominal | Nominal  1,1 \* Nominal  Nominal |

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

## E.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes.

Table E.2.3-1

|  |  |
| --- | --- |
| Frequency | ASD (Acceleration Spectral Density) random vibration |
| 5 Hz to 20 Hz | 0,96 m2/s3 |
| 20 Hz to 500 Hz | 0,96 m2/s3 at 20 Hz, thereafter –3 dB/Octave |

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in TS 36.101 for extreme operation.

Annex F (normative):   
Transmit modulation

# F.1 Measurement Point

Figure F.1-1 shows the measurement point for the unwanted emission falling into non-allocated RB(s) and the EVM for the allocated RB(s).

DFT

IFFT

TX

Front

-

-end

Channel

RF

correction

FFT

Tx

-

Rx chain

equalizer

In

-

band

emissions

meas.

EVM

meas.

0

0

IDFT

DUT

Test equipment

PUCCH and DM-RS der test after the IDFT ispred to QPSK constellation points nal under test after the IDFT is not QPSK modulated in generalEVM meas.

PUCCH and DM-RS

Tone map

PUSCH modulated symbols

Figure F.1-1: EVM measurement points

# F.2 Basic Error Vector Magnitude measurement

The EVM is the difference between the ideal waveform and the measured waveform for the allocated RB(s)

,

where

is a set of  modulation symbols with the considered modulation scheme being active within the measurement period,

 are the samples of the signal evaluated for the EVM,

 is the ideal signal reconstructed by the measurement equipment, and

 is the average power of the ideal signal. For normalized modulation symbols  is equal to 1.

The basic EVM measurement interval is defined over one slot in the time domain for PUCCH and PUSCH and over one preamble sequence for the PRACH.

# F.3 Basic in-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks. The in-band emission requirement is evaluated for PUCCH and PUSCH transmissions. The in-band emission requirement is not evaluated for PRACH transmissions.

The in-band emissions are measured as follows

,

where

is a set of SC-FDMA symbols with the considered modulation scheme being active within the measurement period,

 is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g.  or  for the first adjacent RB),

 (resp. ) is the lower (resp. upper) edge of the UL system BW,

 and  are the lower and upper edge of the allocated BW, and

 is the frequency domain signal evaluated for in-band emissions as defined in the subsection (ii)

The relative in-band emissions are, given by



where

 is the number of allocated RBs

The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

In the evaluation of in-band emissions, the timing is set according to , where sample time offsets  and  are defined in subclause F.4.

# F.4 Modified signal under test

Implicit in the definition of EVM is an assumption that the receiver is able to compensate a number of transmitter impairments.

The PUSCH data or PRACH or Physical Sidelink Channel signal under test is modified and, in the case of PUSCH or Physical Sidelink Channel data signal, decoded according to:



where

 is the time domain samples of the signal under test.

The PUCCH or PUSCH or Physical Sidelink Channel demodulation reference signal or PUCCH data signal under test is equalised and, in the case of PUCCH data signal decoded according to:



where

 is the time domain samples of the signal under test.

To minimize the error, the signal under test should be modified with respect to a set of parameters following the procedure explained below.

Notation:

 is the sample timing difference between the FFT processing window in relation to nominal timing of the ideal signal.

 is the RF frequency offset.

 is the phase response of the TX chain.

 is the amplitude response of the TX chain.

In the following  represents the middle sample of the EVM window of length  (defined in the next subsections) or the last sample of the first window half if is even.

The EVM analyser shall

* detect the start of each slot and estimate  and ,
* determine  so that the EVM window of length  is centred
  + on the time interval determined by the measured cyclic prefix minus 16 samples of the considered OFDM symbol for symbol 0 for normal CP, i.e. the first 16 samples of the CP should not be taken into account for this step. In the determination of the number of excluded samples, a sampling rate of 30.72MHz was assumed. If a different sampling rate is used, the number of excluded samples is scaled linearly.
  + on the measured cyclic prefix of the considered OFDM symbol symbol for symbol 1 to 6 for normal CP and for symbol 0 to 5 for extended CP.
  + on the measured preamble cyclic prefix for the PRACH

To determine the other parameters a sample timing offset equal to  is corrected from the signal under test. The EVM analyser shall then

* correct the RF frequency offset for each time slot, and
* apply an FFT of appropriate size. The chosen FFT size shall ensure that in the case of an ideal signal under test, there is no measured inter-subcarrier interference.

The carrier leakage shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative carrier leakage power also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. In the case of PUCCH and PUSCH EVM, the signal on the non-allocated RB(s), , is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s).

* In the case of PUCCH and PUSCH and Physical Sidelink Channel, the UL EVM analyzer shall estimate the TX chain equalizer coefficients and  used by the ZF equalizer for all subcarriers by time averaging at each signal subcarrier of the amplitude and phase of the reference and data symbols. The time-averaging length is 1 slot. This process creates an average amplitude and phase for each signal subcarrier used by the ZF equalizer. The knowledge of data modulation symbols may be required in this step because the determination of symbols by demodulation is not reliable before signal equalization.
* In the case of PRACH, the UL EVM analyzer shall estimate the TX chain coefficients and  used for phase and amplitude correction and are seleted so as to minimize the resulting EVM. The TX chain coefficients are not dependent on frequency, i.e.  and . The TX chain coefficient are chosen independently for each preamble transmission and for each .

At this stage estimates of , ,  and  are available.  is one of the extremities of the window , i.e. can be  or , where  if  is odd and  if is even. The EVM analyser shall then

* calculate EVMl with  set to ,
* calculate EVMh with  set to .

# F.5 Window length

## F.5.1 Timing offset

As a result of using a cyclic prefix, there is a range of, which, at least in the case of perfect Tx signal quality, would give close to minimum error vector magnitude. As a first order approximation, that range should be equal to the length of the cyclic prefix. Any time domain windowing or FIR pulse shaping applied by the transmitter reduces the  range within which the error vector is close to its minimum.

## F.5.2 Window length

The window length  affects the measured EVM, and is expressed as a function of the configured cyclic prefix length. In the case where equalization is present, as with frequency domain EVM computation, the effect of FIR is reduced. This is because the equalization can correct most of the linear distortion introduced by the FIR. However, the time domain windowing effect can’t be removed.

## F.5.3 Window length for normal CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for normal CP. The nominal window length for 3 MHz is rounded down one sample to allow the window to be centered on the symbol.

Table F.5.3-1 EVM window length for normal CP

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth MHz | Cyclic prefix length1 for symbol 0 | Cyclic prefix length1 for symbols 1 to 6 | Nominal FFT size | Cyclic prefix for symbols 1 to 6 in FFT samples | EVM window length *W* in FFT samples | Ratio of *W* to CP for symbols 1 to 6 2 |
| 1.4 | 160 | 144 | 128 | 9 | 5 | 55.6 |
| 3 | 256 | 18 | 12 | 66.7 |
| 5 | 512 | 36 | 32 | 88.9 |
| 10 | 1024 | 72 | 66 | 91.7 |
| 15 | 1536 | 108 | 102 | 94.4 |
| 20 | 2048 | 144 | 136 | 94.4 |
| Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed.  Note 2: These percentages are informative and apply to symbols 1 through 6. Symbol 0 has a longer CP and therefore a lower percentage. | | | | | | |

## F.5.4 Window length for Extended CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for extended CP. The nominal window lengths for 3 MHz and 15 MHz are rounded down one sample to allow the window to be centered on the symbol.

Table F.5.4-1 EVM window length for extended CP

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Channel Bandwidth MHz | Cyclic prefix length1 | Nominal FFT size | Cyclic prefix in FFT samples | EVM window length *W* in FFT samples | Ratio of *W* to CP 2 |
| 1.4 | 512 | 128 | 32 | 28 | 87.5 |
| 3 | 256 | 64 | 58 | 90.6 |
| 5 | 512 | 128 | 124 | 96.9 |
| 10 | 1024 | 256 | 250 | 97.4 |
| 15 | 1536 | 384 | 374 | 97.4 |
| 20 | 2048 | 512 | 504 | 98.4 |
| Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed.  Note 2: These percentages are informative | | | | | |

## F.5.5 Window length for PRACH

The table below specifies the EVM window length for PRACH preamble formats 0-4.

Table F.5.5-1 EVM window length for PRACH

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Preamble format | Cyclic prefix length1 | Nominal FFT size2 | EVM window length *W* in FFT samples | Ratio of *W* to CP\* |
| 0 | 3168 | 24576 | 3072 | 96.7% |
| 1 | 21024 | 24576 | 20928 | 99.5% |
| 2 | 6240 | 49152 | 6144 | 98.5% |
| 3 | 21024 | 49152 | 20928 | 99.5% |
| 4 | 448 | 4096 | 432 | 96.4% |
| Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed  Note 2: The use of other FFT sizes is possible as long as appropriate scaling of the window length is applied  Note 3: These percentages are informative | | | | |

### F.5.F Window length for category NB1

The EVM window length, W, for NPUSCH is set to 1 (in FFT samples where the nominal FFT size is 128 for 15 kHz sub-carrier spacing and 512 for 3.75 kHz sub-carrier spacing).

The EVM window length, W, for NPRACH is set to 110 for preamble format 0 and to 494 for preamble format 1 (both in FFT samples where the nominal FFT size is 512).

# F.6 Averaged EVM

The general EVM is averaged over basic EVM measurements for n slots in the time domain.

,

where n is

n = 20 for PUCCH, PUSCH, PSDCH, PSCCH, and PSSCH,

n = 48 for PBSCH.

The EVM requirements shall be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus is calculated using in the expressions above and is calculated using .

Thus we get:



The calculation of the EVM for the demodulation reference signal, , follows the same procedure as calculating the general EVM, with the exception that the modulation symbol set  defined in clause F.2 is restricted to symbols containing uplink demodulation reference signals.

The basic  measurements are first averaged over 20 slots in the time domain to obtain an intermediate average .



In the determination of each , the timing is set to  if , and it is set to  otherwise, where  and  are the general average EVM values calculated in the same 20 slots over which the intermediate average  is calculated. Note that in some cases, the general average EVM may be calculated only for the purpose of timing selection for the demodulation reference signal EVM.

Then the results are further averaged to get the EVM for the demodulation reference signal, ,



The PRACH EVM, , is averaged over two preamble sequence measurements for preamble formats 0, 1, 2, 3, and it is averaged over 10 preamble sequence measurements for preamble format 4.

The EVM requirements shall be tested against the maximum of the RMS average at the window *W* extremities of the EVM measurements:

Thus is calculated using  and is calculated using .

Thus we get:



### F.6.F Averaged EVM for category NB1

The general EVM for category NB1 is calculated using the procedure defined in Annex F.6 with the exception that the general EVM is averaged over basic EVM measurements for 240/*LCtone* slots in the time domain, where *LCtone* = {1, 3, 6, 12} is the number of subcarriers for the transmission.

The calculation of the EVM for the demodulation reference symbols for category NB1 follows the procedure defined for DMRS in Annex F.6 with the exception that the basic *EVM* DMRS measurements are first averaged over 240/ *LCtone* slots to obtain the intermediate average EVM.

The calculation of the NPRACH EVM for both formats follows the procedure defined for PRACH in Annex F.6 with the exception that *EVM* PRACH is averaged over 64 preamble measurements.

# F.7 Spectrum Flatness

The data shall be taken from FFT coded data symbols and the demodulation reference symbols of the allocated resource block.

Annex G (informative):   
Reference sensitivity level in lower SNR

This annex contains information on typical receiver sensitivity when HARQ transmission is enabled allowing operation in lower SNR regions (HARQ is disabled in conformance testing), thus representing the configuration normally used in live network operation under noise-limited conditions.

# G.1 General

The reference sensitivity power level PSENS with HARQ retransmission enabled (operation in lower SNR) is the minimum mean power applied to both the UE antenna ports at which the residual BLER after HARQ shall meet the requirements for the specified reference measurement channel. The residual BLER after HARQ transmission is defined as follows:



: Number of correctly decoded MAC PDUs

: Number of transmitted MAC PDUs (Retransmitted MAC PDUs are not counted)

# G.2 Typical receiver sensitivity performance (QPSK)

The residual BLER after HARQ shall be lower than 1% for the reference measurement channels as specified in Annexes G.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table G.2-1 and Table G.2-2

Table G.2-1: Reference sensitivity QPSK PSENS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | |
| E-UTRA Band | 1.4 MHz  (dBm) | 3 MHz  (dBm) | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | Duplex Mode |
| 1 |  |  |  | [-102] |  |  | FDD |
| 2 |  |  |  | TBD |  |  | FDD |
| 3 |  |  |  | TBD |  |  | FDD |
| 4 |  |  |  | TBD |  |  | FDD |
| 5 |  |  |  | TBD |  |  | FDD |
| 6 |  |  |  | TBD |  |  | FDD |
| 7 |  |  |  | TBD |  |  | FDD |
| 8 |  |  |  | TBD |  |  | FDD |
| 9 |  |  |  | TBD |  |  | FDD |
| 10 |  |  |  | TBD |  |  | FDD |
| 11 |  |  |  | TBD |  |  | FDD |
| 12 |  |  |  | TBD |  |  | FDD |
| 13 |  |  |  | TBD |  |  | FDD |
| 14 |  |  |  | TBD |  |  | FDD |
| … |  |  |  |  |  |  |  |
| 17 |  |  |  | TBD |  |  | FDD |
| 18 |  |  |  | TBD |  |  | FDD |
| 19 |  |  |  | TBD |  |  | FDD |
| 20 |  |  |  | TBD |  |  | FDD |
| 21 |  |  |  | TBD |  |  | FDD |
| 22 |  |  |  | TBD |  |  | FDD |
| 23 |  |  |  | TBD |  |  | FDD |
| 24 |  |  |  | TBD |  |  | FDD |
| 26 |  |  |  | TBD |  |  | FDD |
| 27 |  |  |  | TBD |  |  | FDD |
| 28 |  |  |  | TBD |  |  | FDD |
| 30 |  |  |  | TBD |  |  | FDD |
| 31 |  |  | TBD |  |  |  | FDD |
| … |  |  |  |  |  |  |  |
| 33 |  |  |  | [-102] |  |  | TDD |
| 34 |  |  |  | [-102] |  |  | TDD |
| 35 |  |  |  | [-102] |  |  | TDD |
| 36 |  |  |  | [-102] |  |  | TDD |
| 37 |  |  |  | [-102] |  |  | TDD |
| 38 |  |  |  | [-102] |  |  | TDD |
| 39 |  |  |  | [-102] |  |  | TDD |
| 40 |  |  |  | [-102] |  |  | TDD |
| 42 |  |  |  | [-102] |  |  | TDD |
| 43 |  |  |  | [-102] |  |  | TDD |
| 44 |  |  |  | [-102] |  |  | TDD |
| 45 |  |  |  | [-102] |  |  | TDD |
| … |  |  |  |  |  |  |  |
| 65 |  |  |  | TBD |  |  | FDD |
| 70 |  |  |  | TBD |  |  | FDD |
| 71 |  |  |  | TBD |  |  | FDD |
| 87 |  |  | TBD |  |  |  | FDD |
| 88 |  |  | TBD |  |  |  | FDD |
| Note 1: The transmitter shall be set to PUMAX as defined in clause 6.2.5  Note 2: Reference measurement channel is G.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1  Note 3: The signal power is specified per port  Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.  Note 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS. | | | | | | | |

Table G.2-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement in lower SNR must be met.

Table G.2-2: Minimum uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth / NRB / Duplex mode | | | | | | | |
| E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| 1 |  |  |  | [6]1 |  |  | FDD |
| 2 |  |  |  | [6]1 |  |  | FDD |
| 3 |  |  |  | [6]1 |  |  | FDD |
| 4 |  |  |  | [6]1 |  |  | FDD |
| 5 |  |  |  | [6]1 |  |  | FDD |
| 6 |  |  |  | [6]1 |  |  | FDD |
| 7 |  |  |  | [6]1 |  |  | FDD |
| 8 |  |  |  | [6]1 |  |  | FDD |
| 9 |  |  |  | [6]1 |  |  | FDD |
| 10 |  |  |  | [6]1 |  |  | FDD |
| 11 |  |  |  | [6]1 |  |  | FDD |
| 12 |  |  |  | [6]1 |  |  | FDD |
| 13 |  |  |  | [6]1 |  |  | FDD |
| 14 |  |  |  | [6]1 |  |  | FDD |
| … |  |  |  |  |  |  |  |
| 17 |  |  |  | [6]1 |  |  | FDD |
| 18 |  |  |  | [6]1 |  |  | FDD |
| 19 |  |  |  | [6]1 |  |  | FDD |
| 20 |  |  |  | [6]1 |  |  | FDD |
| 22 |  |  |  | [6]1 |  |  | FDD |
| 21 |  |  |  | [6]1 |  |  | FDD |
| 23 |  |  |  | [6]1 |  |  | FDD |
| 24 |  |  |  | [6]1 |  |  | FDD |
| 26 |  |  |  | [6]1 |  |  | FDD |
| 27 |  |  |  | [6]1 |  |  | FDD |
| 28 |  |  |  | [6]1 |  |  | FDD |
| 30 |  |  |  | [6]1 |  |  | FDD |
| 31 |  |  | [5]4 |  |  |  | FDD |
| … |  |  |  |  |  |  |  |
| 33 |  |  |  | 50 |  |  | TDD |
| 34 |  |  |  | 50 |  |  | TDD |
| 35 |  |  |  | 50 |  |  | TDD |
| 36 |  |  |  | 50 |  |  | TDD |
| 37 |  |  |  | 50 |  |  | TDD |
| 38 |  |  |  | 50 |  |  | TDD |
| 39 |  |  |  | 50 |  |  | TDD |
| 40 |  |  |  | 50 |  |  | TDD |
| 42 |  |  |  | 50 |  |  | TDD |
| 43 |  |  |  | 50 |  |  | TDD |
| 44 |  |  |  | 50 |  |  | TDD |
| 45 |  |  |  | 50 |  |  | TDD |
| … |  |  |  |  |  |  |  |
| 65 |  |  |  | [6]1 |  |  | FDD |
| … |  |  |  |  |  |  |  |
| 70 |  |  |  | [6]1 |  |  | FDD |
| 71 |  |  |  | [6]1 |  |  | FDD |
| 87 |  |  | [5]4 |  |  |  | FDD |
| 88 |  |  | [5]4 |  |  |  | FDD |
| Note 1: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).  Note 2: For the UE which supports both Band 11 and Band 21 the minimum uplink configuration for reference sensitivity is FFS.  Note 3: For Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart \_11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart \_16  Note 4: For Band 31, 87, 88; in the case of 5MHz channel bandwidth, the UL resource blocks shall be located at RBstart \_10 | | | | | | | |

Unless given by Table G.2-3, the minimum requirements specified in Tables G.2-1 and G.2-2 shall be verified with the network signalling value NS\_01 (Table 6.2.4-1) configured.

Table G.2-3: Network Signalling Value for reference sensitivity

|  |  |
| --- | --- |
| **Network Signalling value** | **E-UTRA Band** |
| NS\_03 | 2, 4, 10, 23, 35, 36, 70 |
| NS\_06 | 12,13,14,17 |
| NS\_08 | 19 |
| NS\_09 | 21 |
| NS\_21 | 30 |
| NS\_35 | 71 |
| NS\_56 | 24 |

# G.3 Reference measurement channel for REFSENSE in lower SNR

Tables G.3-1 and G.3-2 are applicable for Annex G.2 (Reference sensitivity level in lower SNR).

Table G.3-1 Fixed Reference Channel for Receiver Requirements (FDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel bandwidth | MHz |  |  | 5 | 10 |  |  |
| Allocated resource blocks |  |  |  | 25 | 50 |  |  |
| Subcarriers per resource block |  |  |  | 12 | 12 |  |  |
| Allocated subframes per Radio Frame |  |  |  | 9 | 9 |  |  |
| Modulation |  |  |  | QPSK | QPSK |  |  |
| Target Coding Rate |  |  |  | 1/3 | 1/3 |  |  |
| Number of HARQ Processes | Processes |  |  | 8 | 8 |  |  |
| Maximum number of HARQ transmissions |  |  |  | [4] | [4] |  |  |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 2216 | 4392 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 1800 | 4392 |  |  |
| Transport block CRC | Bits |  |  | 24 | 24 |  |  |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 1 | 1 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 1 | 1 |  |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  | 6300 | 13800 |  |  |
| For Sub-Frame 5 | Bits |  |  | N/A | N/A |  |  |
| For Sub-Frame 0 | Bits |  |  | 5460 | 12960 |  |  |
| Max. Throughput averaged over 1 frame | kbps |  |  | 1952.8 | 3952.8 |  |  |
| UE Category |  |  |  | 1-8 | 1-8 |  |  |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz  Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: 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 4: Redundancy version coding sequence is {0, 1, 2, 3} for QPSK. | | | | | | | |

Table G.3-2 Fixed Reference Channel for Receiver Requirements (TDD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | |
| Channel Bandwidth | MHz |  |  |  | 10 |  |  |
| Allocated resource blocks |  |  |  |  | 50 |  |  |
| Uplink-Downlink Configuration (Note 5) |  |  |  |  | 1 |  |  |
| Allocated subframes per Radio Frame (D+S) |  |  |  |  | 4+2 |  |  |
| Number of HARQ Processes | Processes |  |  |  | 7 |  |  |
| Maximum number of HARQ transmission |  |  |  |  | [4] |  |  |
| Modulation |  |  |  |  | QPSK |  |  |
| Target coding rate |  |  |  |  | 1/3 |  |  |
| Information Bit Payload per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  |  |  |  | 4392 |  |  |
| For Sub-Frame 1, 6 |  |  |  |  | 3240 |  |  |
| For Sub-Frame 5 |  |  |  |  | N/A |  |  |
| For Sub-Frame 0 |  |  |  |  | 4392 |  |  |
| Transport block CRC | Bits |  |  |  | 24 |  |  |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  |  |  |  | 1 |  |  |
| For Sub-Frame 1, 6 |  |  |  |  | 1 |  |  |
| For Sub-Frame 5 |  |  |  |  | N/A |  |  |
| For Sub-Frame 0 |  |  |  |  | 1 |  |  |
| Binary Channel Bits Per Sub-Frame | Bits |  |  |  |  |  |  |
| For Sub-Frame 4, 9 |  |  |  |  | 13800 |  |  |
| For Sub-Frame 1, 6 |  |  |  |  | 11256 |  |  |
| For Sub-Frame 5 |  |  |  |  | N/A |  |  |
| For Sub-Frame 0 |  |  |  |  | 13104 |  |  |
| Max. Throughput averaged over 1 frame | kbps |  |  |  | 1965.6 |  |  |
| UE Category |  |  |  |  | 1-5 |  |  |
| Note 1: For normal subframes(0,4,5,9), 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 [4]  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 [4]  Note 6: Redundancy version coding sequence is {0, 1, 2, 3} for QPSK. | | | | | | | |

Annex H (normative):   
Modified MPR behavior

# H.1 Indication of modified MPR behavior

This annex contains the definitions of the bits in the field *modifiedMPRbehavior* indicated in the IE UE Radio Access Capability [7] by a UE supporting an MPR or A-MPR modified in a later release of this specification.

Table H.1-1: Definitions of the bits in the field *modifiedMPRbehavior*

|  |  |  |
| --- | --- | --- |
| Index of field (bit number) | Definition  (description of the supported functionality if indicator set to one) | Notes |
| 0 (leftmost bit) | - The MPR for intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation specified in Clause 6.2.3A in version 12.5.0 of this specification | - This bit shall be set to 1 by a UE supporting intra-band contiguous CA bandwidth class C |
| 1 | - The A-MPR associated with NS\_05 for Band 1 in Clause 6.2.4 in version 12.10.0 of this specification. | - This bit shall be set to 1 by a UE supporting A-MPR associated to NS\_05 for Band 1. |
| 2 | The A-MPR associated with NS\_04 for Band 41 in Table 6.2.4-4 in version 14.1.0 of this specification. | - This bit shall be set to 1 by a power class 3 UE supporting A-MPR associated to NS\_04 for Band 41. |
| 3 | The A-MPR associated with NS\_31 for Band 46 in Table 6.2.4-26 in version 15.3.0 of this specification. | - This bit shall be set to 1 by a UE supporting A-MPR associated to NS\_31 for Band 46. |

Annex I (normative):   
Supported Post Antenna Gain

# I.1 Declared Supported Post Antenna Gain for UE

For V2X service at band 47, some regional requirements (region 1) are defined per effective isotropic radiated power (EIRP), which is a combination of the transmitted power (or in some cases spectral density) and the effective antenna gain.

Due to large form factor, V2X UE can have external antenna placed far away from the chipset unit. In this case, the effective antenna gain is a UE specific condition. This effective antenna gain includes the feeding loss of all components after the chipset unit antenna connector and the peak directional gain of the external antenna and hence will be call the post connector gain Gpost connector.

The 3GPP specifications mandate UE manufacturer declarations of at least one supported value of the post connector gain Gpost connector as a way to accommodate the refered regional requirement without putting requirements on the UE specific condtion.

The possible values of declared supported post connector gains are: 0, 1, 2, 3, 4, 5, 6, 7 dBi. If no value is declared, or if external antenna is not used, the default value of 0dBi will be used.

The regional requirements in PEIRP in Subclauses 6.2.2G, 6.2.5G, 6.6.2.2.4, 6.6.3.2 and 7.9.1 will be converted to conducted requirements by subtracting Gpost connector as.

PConducted = PEIRP - Gpost connector.

Annex J (informative):   
Change history

Table J.1: Change History

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 11-2007 | R4#45 | R4-72206 |  |  |  | TS36.101V0.1.0 approved by RAN4 |  |
| 12-2007 | RP#38 | RP-070979 |  |  |  | Approved version at TSG RAN #38 | 8.0.0 |
| 03-2008 | RP#39 | RP-080123 | 3 |  |  | TS36.101 - Combined updates of E-UTRA UE requirements | 8.1.0 |
| 05-2008 | RP#40 | RP-080325 | 4 |  |  | TS36.101 - Combined updates of E-UTRA UE requirements | 8.2.0 |
| 09-2008 | RP#41 | RP-080638 | 5r1 |  |  | Addition of Ref Sens figures for 1.4MHz and 3MHz Channel bandwiidths | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 7r1 |  |  | Transmitter intermodulation requirements | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 10 |  |  | CR for clarification of additional spurious emission requirement | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 15 |  |  | Correction of In-band Blocking Requirement | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 18r1 |  |  | TS36.101: CR for section 6: NS\_06 | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 19r1 |  |  | TS36.101: CR for section 6: Tx modulation | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 20r1 |  |  | TS36.101: CR for UE minimum power | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 21r1 |  |  | TS36.101: CR for UE OFF power | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 24r1 |  |  | TS36.101: CR for section 7: Band 13 Rx sensitivity | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 26 |  |  | UE EVM Windowing | 8.3.0 |
| 09-2008 | RP#41 | RP-080638 | 29 |  |  | Absolute ACLR limit | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 23r2 |  |  | TS36.101: CR for section 6: UE to UE co-existence | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 30 |  |  | Removal of [ ] for UE Ref Sens figures | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 31 |  |  | Correction of PA, PB definition to align with RAN1 specification | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 37r2 |  |  | UE Spurious emission band UE co-existence | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 44 |  |  | Definition of specified bandwidths | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 48r3 |  |  | Addition of Band 17 | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 50 |  |  | Alignment of the UE ACS requirement | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 52r1 |  |  | Frequency range for Band 12 | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 54r1 |  |  | Absolute power tolerance for LTE UE power control | 8.3.0 |
| 09-2008 | RP#41 | RP-080731 | 55 |  |  | TS36.101 section 6: Tx modulation | 8.3.0 |
| 09-2008 | RP#41 | RP-080732 | 6r2 |  |  | DL FRC definition for UE Receiver tests | 8.3.0 |
| 09-2008 | RP#41 | RP-080732 | 46 |  |  | Additional UE demodulation test cases | 8.3.0 |
| 09-2008 | RP#41 | RP-080732 | 47 |  |  | Updated descriptions of FRC | 8.3.0 |
| 09-2008 | RP#41 | RP-080732 | 49 |  |  | Definition of UE transmission gap | 8.3.0 |
| 09-2008 | RP#41 | RP-080732 | 51 |  |  | Clarification on High Speed train model in 36.101 | 8.3.0 |
| 09-2008 | RP#41 | RP-080732 | 53 |  |  | Update of symbol and definitions | 8.3.0 |
| 09-2008 | RP#41 | RP-080743 | 56 |  |  | Addition of MIMO (4x2) and (4x4) Correlation Matrices | 8.3.0 |
| 12-2008 | RP#42 | RP-080908 | 94r2 |  |  | CR TX RX channel frequency separation | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 105r1 |  |  | UE Maximum output power for Band 13 | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 60 |  |  | UL EVM equalizer definition | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 63 |  |  | Correction of UE spurious emissions | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 66 |  |  | Clarification for UE additional spurious emissions | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 72 |  |  | Introducing ACLR requirement for coexistance with UTRA 1.6MHZ channel from 36.803 | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 75 |  |  | Removal of [] from Section 6 transmitter characteristcs | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 81 |  |  | Clarification for PHS band protection | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 101 |  |  | Alignement for the measurement interval for transmit signal quality | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 98r1 |  |  | Maximum power | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 57r1 |  |  | CR UE spectrum flatness | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 71r1 |  |  | UE in-band emission | 8.4.0 |
| 12-2008 | RP#42 | RP-080909 | 58r1 |  |  | CR Number of TX exceptions | 8.4.0 |
| 12-2008 | RP#42 | RP-080951 | 99r2 |  |  | CR UE output power dynamic | 8.4.0 |
| 12-2008 | RP#42 | RP-080951 | 79r1 |  |  | LTE UE transmitter intermodulation | 8.4.0 |
| 12-2008 | RP#42 | RP-080910 | 91 |  |  | Update of Clause 8 | 8.4.0 |
| 12-2008 | RP#42 | RP-080950 | 106r1 |  |  | Structure of Clause 9 including CSI requirements for PUCCH mode 1-0 | 8.4.0 |
| 12-2008 | RP#42 | RP-080911 | 59 |  |  | CR UE ACS test frequency offset | 8.4.0 |
| 12-2008 | RP#42 | RP-080911 | 65 |  |  | Correction of spurious response parameters | 8.4.0 |
| 12-2008 | RP#42 | RP-080911 | 80 |  |  | Removal of LTE UE narrowband intermodulation | 8.4.0 |
| 12-2008 | RP#42 | RP-080911 | 90r1 |  |  | Introduction of Maximum Sensitivity Degradation | 8.4.0 |
| 12-2008 | RP#42 | RP-080911 | 103 |  |  | Removal of [] from Section 7 Receiver characteristic | 8.4.0 |
| 12-2008 | RP#42 | RP-080912 | 62 |  |  | Alignement of TB size n Ref Meas channel for RX characteristics | 8.4.0 |
| 12-2008 | RP#42 | RP-080912 | 78 |  |  | TDD Reference Measurement channel for RX characterisctics | 8.4.0 |
| 12-2008 | RP#42 | RP-080912 | 73r1 |  |  | Addition of 64QAM DL referenbce measurement channel | 8.4.0 |
| 12-2008 | RP#42 | RP-080912 | 74r1 |  |  | Addition of UL Reference Measurement Channels | 8.4.0 |
| 12-2008 | RP#42 | RP-080912 | 104 |  |  | Reference measurement channels for PDSCH performance requirements (TDD) | 8.4.0 |
| 12-2008 | RP#42 | RP-080913 | 68 |  |  | MIMO Correlation Matrix Corrections | 8.4.0 |
| 12-2008 | RP#42 | RP-080915 | 67 |  |  | Correction to the figure with the Transmission Bandwidth configuration | 8.4.0 |
| 12-2008 | RP#42 | RP-080916 | 77 |  |  | Modification to EARFCN | 8.4.0 |
| 12-2008 | RP#42 | RP-080917 | 85r1 |  |  | New Clause 5 outline | 8.4.0 |
| 12-2008 | RP#42 | RP-080919 | 102 |  |  | Introduction of Bands 12 and 17 in 36.101 | 8.4.0 |
| 12-2008 | RP#42 | RP-080927 | 84r1 |  |  | Clarification of HST propagation conditions | 8.4.0 |
| 03-2009 | RP#43 | RP-090170 | 156r2 |  |  | A-MPR table for NS\_07 | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 170 |  |  | Corrections of references (References to tables and figures) | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 108 |  |  | Removal of [ ] from Transmitter Intermodulation | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 155 |  |  | E-UTRA ACLR for below 5 MHz bandwidths | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 116 |  |  | Clarification of PHS band including the future plan | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 119 |  |  | Spectrum emission mask for 1.4 MHz and 3 MHz bandwidhts | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 120 |  |  | Removal of “Out-of-synchronization handling of output power” heading | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 126 |  |  | UE uplink power control | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 128 |  |  | Transmission BW Configuration | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 130 |  |  | Spectrum flatness | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 132r2 |  |  | PUCCH EVM | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 134 |  |  | UL DM-RS EVM | 8.5.0 |
| 03-2009 | RP#43 | RP-090170 | 140 |  |  | Removal of ACLR2bis requirements | 8.5.0 |
| 03-2009 | RP#43 | RP-090171 | 113 |  |  | In-band blocking | 8.5.0 |
| 03-2009 | RP#43 | RP-090171 | 127 |  |  | In-band blocking and sensitivity requirement for band 17 | 8.5.0 |
| 03-2009 | RP#43 | RP-090171 | 137r1 |  |  | Wide band intermodulation | 8.5.0 |
| 03-2009 | RP#43 | RP-090171 | 141 |  |  | Correction of reference sensitivity power level of Band 9 | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 109 |  |  | AWGN level for UE DL demodulation performance tests | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 124 |  |  | Update of Clause 8: additional test cases | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 139r1 |  |  | Performance requirement structure for TDD PDSCH | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 142r1 |  |  | Performance requirements and reference measurement channels for TDD PDSCH demodulation with UE-specific reference symbols | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 145 |  |  | Number of information bits in DwPTS | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 160r1 |  |  | MBSFN-Unicast demodulation test case | 8.5.0 |
| 03-2009 | RP#43 | RP-090172 | 163r1 |  |  | MBSFN-Unicast demodulation test case for TDD | 8.5.0 |
| 03-2009 | RP#43 | RP-090173 | 162 |  |  | Clarification of EARFCN for 36.101 | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 110 |  |  | Correction to UL Reference Measurement Channel | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 114 |  |  | Addition of MIMO (4x4, medium) Correlation Matrix | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 121 |  |  | Correction of 36.101 DL RMC table notes | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 125 |  |  | Update of Clause 9 | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 138r1 |  |  | Clarification on OCNG | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 161 |  |  | CQI reference measurement channels | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 164 |  |  | PUCCH 1-1 Static Test Case | 8.5.0 |
| 03-2009 | RP#43 | RP-090369 | 111 |  |  | Reference Measurement Channel for TDD | 8.5.0 |
| 03-2009 | RP#44 |  |  |  |  | Editorial correction in Table 6.2.4-1 | 8.5.1 |
| 05-2009 | RP#44 | RP-090540 | 167 |  |  | Boundary between E-UTRA fOOB and spurious emission domain for 1.4 MHz and 3 MHz bandwiths. (Technically Endorsed CR in R4-50bis - R4-091205) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 168 |  |  | EARFCN correction for TDD DL bands. (Technically Endorsed CR in R4-50bis - R4-091206) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 169 |  |  | Editorial correction to in-band blocking table. (Technically Endorsed CR in R4-50bis - R4-091238) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 171 |  |  | CR PRACH EVM. (Technically Endorsed CR in R4-50bis - R4-091308) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 172 |  |  | CR EVM correction. (Technically Endorsed CR in R4-50bis - R4-091309) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 177 |  |  | CR power control accuracy. (Technically Endorsed CR in R4-50bis - R4-091418) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 179 |  |  | Correction of SRS requirements. (Technically Endorsed CR in R4-50bis - R4-091426) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 186 |  |  | Clarification for EVM. (Technically Endorsed CR in R4-50bis - R4-091512) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 187 |  |  | Removal of [ ] from band 17 Refsens values and ACS offset frequencies | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 191 |  |  | Completion of band17 requirements | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 192 |  |  | Removal of 1.4 MHz and 3 MHz bandwidths from bands 13, 14 and 17. | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 223 |  |  | CR: 64 QAM EVM | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 201 |  |  | CR In-band emissions | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 203 |  |  | CR EVM exclusion period | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 204 |  |  | CR In-band emissions timing | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 206 |  |  | CR Minimum Rx exceptions | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 207 |  |  | CR UL DM-RS EVM | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 218r1 |  |  | A-MPR table for NS\_07 | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 205r1 |  |  | CR In-band emissions in shortened subframes | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 200r1 |  |  | CR PUCCH EVM | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 178r2 |  |  | No additional emission mask indication. (Technically Endorsed CR in R4-50bis - R4-091421) | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 220r1 |  |  | Spectrum emission requirements for band 13 | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 197r2 |  |  | CR on aggregate power tolerance | 8.6.0 |
| 05-2009 | RP#44 | RP-090540 | 196r2 |  |  | CR: Rx IP2 performance | 8.6.0 |
| 05-2009 | RP#44 | RP-090541 | 198r1 |  |  | Maximum output power relaxation | 8.6.0 |
| 05-2009 | RP#44 | RP-090542 | 166 |  |  | Update of performance requirement for TDD PDSCH with MBSFN configuration. (Technically Endorsed CR in R4-50bis - R4-091180) | 8.6.0 |
| 05-2009 | RP#44 | RP-090542 | 175 |  |  | Adding AWGN levels for some TDD DL performance requirements. (Technically Endorsed CR in R4-50bis - R4-091406) | 8.6.0 |
| 05-2009 | RP#44 | RP-090542 | 182 |  |  | OCNG Patterns for Single Resource Block FRC Requirements. (Technically Endorsed CR in R4-50bis - R4-091504) | 8.6.0 |
| 05-2009 | RP#44 | RP-090542 | 170r1 |  |  | Update of Clause 8: PHICH and PMI delay. (Technically Endorsed CR in R4-50bis - R4-091275) | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 183 |  |  | Requirements for frequency-selective fading test. (Technically Endorsed CR in R4-50bis - R4-091505) | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 199 |  |  | CQI requirements under AWGN conditions | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 188r1 |  |  | Adaptation of UL-RMC-s for supporting more UE categories | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 193r1 |  |  | Correction of the LTE UE downlink reference measurement channels | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 184r1 |  |  | Requirements for frequency non-selective fading tests. (Technically Endorsed CR in R4-50bis - R4-091506) | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 185r1 |  |  | Requirements for PMI reporting. (Technically Endorsed CR in R4-50bis - R4-091510) | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 221r1 |  |  | Correction to DL RMC-s for Maximum input level for supporting more UE-Categories | 8.6.0 |
| 05-2009 | RP#44 | RP-090543 | 216 |  |  | Addition of 15 MHz and 20 MHz bandwidths into band 38 | 8.6.0 |
| 05-2009 | RP#44 | RP-090559 | 180 |  |  | Introduction of Extended LTE800 requirements. (Technically Endorsed CR in R4-50bis - R4-091432) | 9.0.0 |
| 09-2009 | RP#45 | RP-090826 | 239 |  |  | A-MPR for Band 19 | 9.1.0 |
| 09-2009 | RP#45 | RP-090822 | 225 |  |  | LTE UTRA ACLR1 centre frequency definition for 1.4 and 3 MHz BW | 9.1.0 |
| 09-2009 | RP#45 | RP-090822 | 227 |  |  | Harmonization of text for LTE Carrier leakage | 9.1.0 |
| 09-2009 | RP#45 | RP-090822 | 229 |  |  | Sensitivity requirements for Band 38 15 MHz and 20 MHz bandwidths | 9.1.0 |
| 09-2009 | RP#45 | RP-090822 | 236 |  |  | Operating band edge relaxation of maximum output power for Band 18 and 19 | 9.1.0 |
| 09-2009 | RP#45 | RP-090822 | 238 |  |  | Addition of 5MHz channel bandwidth for Band 40 | 9.1.0 |
| 09-2009 | RP#45 | RP-090822 | 245 |  |  | Removal of unnecessary requirements for 1.4 and 3 MHz bandwidths on bands 13 and 17 | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 261 |  |  | Correction of LTE UE ACS test parameter | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 263R1 |  |  | Correction of LTE UE ACLR test parameter | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 286 |  |  | Uplink power and RB allocation for receiver tests | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 320 |  |  | CR Sensitivity relaxation for small BW | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 324 |  |  | Correction of Band 3 spurious emission band UE co-existence | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 249R1 |  |  | CR Pcmax definition (working assumption) | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 330 |  |  | Spectrum flatness clarification | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 332 |  |  | Transmit power: removal of TC and modification of REFSENS note | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 282R1 |  |  | Additional SRS relative power requirement and update of measurement definition | 9.1.0 |
| 09-2009 | RP#45 | RP-090877 | 284R1 |  |  | Power range applicable for relative tolerance | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 233 |  |  | TDD UL/DL configurations for CQI reporting | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 235 |  |  | Further clarification on CQI test configurations | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 243 |  |  | Corrections to UL- and DL-RMC-s | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 247 |  |  | Reference measurement channel for multiple PMI requirements | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 290 |  |  | CQI reporting test for a scenario with frequency-selective interference | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 265R2 |  |  | CQI reference measurement channels | 9.1.0 |
| 09-2009 | RP#45 | RP-090878 | 321R1 |  |  | CR RI Test | 9.1.0 |
| 09-2009 | RP#45 | RP-090875 | 231 |  |  | Correction of parameters for demodulation performance requirement | 9.1.0 |
| 09-2009 | RP#45 | RP-090875 | 241R1 |  |  | UE categories for performance tests and correction to RMC references | 9.1.0 |
| 09-2009 | RP#45 | RP-090875 | 333 |  |  | Clarification of Ês definition in the demodulation requirement | 9.1.0 |
| 09-2009 | RP#45 | RP-090875 | 326 |  |  | Editorial corrections and updates to PHICH PBCH test cases. | 9.1.0 |
| 09-2009 | RP#45 | RP-090875 | 259R3 |  |  | Test case numbering in section 8 Performance tests | 9.1.0 |
| 12-2009 | RP-46 | RP-091264 | 335 |  |  | Test case numbering in TDD PDSCH performance test (Technically endorsed at RAN 4 52bis in R4-093523) | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 337 |  |  | Adding beamforming model for user-specfic reference signal (Technically endorsed at RAN 4 52bis in R4-093525) | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 339R1 |  |  | Adding redundancy sequences to PMI test (Technically endorsed at RAN 4 52bis in R4-093581) | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 341 |  |  | Throughput value correction at FRC for Maximum input level (Technically endorsed at RAN 4 52bis in R4-093660) | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 343 |  |  | Correction to the modulated E-UTRA interferer (Technically endorsed at RAN 4 52bis in R4-093662) | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 345R1 |  |  | OCNG: Patterns and present use in tests (Technically endorsed at RAN 4 52bis in R4-093664) | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 347 |  |  | OCNG: Use in receiver and performance tests (Technically endorsed at RAN 4 52bis in R4-093666) | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 349 |  |  | Miscellaneous corrections on CSI requirements (Technically endorsed at RAN 4 52bis in R4-093676) | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 351 |  |  | Removal of RLC modes (Technically endorsed at RAN 4 52bis in R4-093677) | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 353 |  |  | CR Rx diversity requirement (Technically endorsed at RAN 4 52bis in R4-093703) | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 355 |  |  | A-MPR notation in NS\_07 (Technically endorsed at RAN 4 52bis in R4-093706) | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 359 |  |  | Single- and multi-PMI requirements (Technically endorsed at RAN 4 52bis in R4-093846) | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 363 |  |  | CQI reference measurement channel (Technically endorsed at RAN 4 52bis in R4-093970) | 9.2.0 |
| 12-2009 | RP-46 | RP-091292 | 364 |  |  | LTE MBSFN Channel Model (Technically endorsed at RAN 4 52bis in R4-094020) | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 367 |  |  | Numbering of PDSCH (User-Specific Reference Symbols) Demodulation Tests | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 369 |  |  | Numbering of PDCCH/PCFICH, PHICH, PBCH Demod Tests | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 371 |  |  | Remove [ ] from Reference Measurement Channels in Annex A | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 373R1 |  |  | Corrections to RMC-s for Maximum input level test for low UE categories | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 377 |  |  | Correction of UE-category for R.30 | 9.2.0 |
| 12-2009 | RP-46 | RP-091286 | 378 |  |  | Introduction of Extended LTE1500 requirements for TS36.101 | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 384 |  |  | CR: Removal of 1.4 MHz and 3 MHz channel bandwidths from additional spurious emissions requirements for Band 1 PHS protection | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 386R3 |  |  | Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 390 |  |  | Spurious emission table correction for TDD bands 33 and 38. | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 392R2 |  |  | 36.101 Symbols and abreviations for Pcmax | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 394 |  |  | UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 396 |  |  | Introduction of the ACK/NACK feedback modes for TDD requirements | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 404R3 |  |  | CR Power control exception R8 | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 416R1 |  |  | Relative power tolerance: special case for receiver tests | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 420R1 |  |  | CSI reporting: test configuration for CQI fading requirements | 9.2.0 |
| 12-2009 | RP-46 | RP-091284 | 421R1 |  |  | Inclusion of Band 20 UE RF parameters | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 425 |  |  | Editorial corrections and updates to Clause 8.2.1 FDD demodulation test cases | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 427 |  |  | CR: time mask | 9.2.0 |
| 12-2009 | RP-46 | RP-091264 | 430 |  |  | Correction of the payload size for PDCCH/PCFICH performance requirements | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 432 |  |  | Transport format and test point updates to RI reporting test cases | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 434 |  |  | Transport format and test setup updates to frequency-selective interference CQI tests | 9.2.0 |
| 12-2009 | RP-46 | RP-091263 | 436 |  |  | CR RI reporting configuration in PUCCH 1-1 test | 9.2.0 |
| 12-2009 | RP-46 | RP-091261 | 438 |  |  | Addition of R.11-1 TDD references | 9.2.0 |
| 12-2009 | RP-46 | RP-091292 | 439 |  |  | Performance requirements for LTE MBMS | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 442R1 |  |  | In Band Emissions Requirements Correction CR | 9.2.0 |
| 12-2009 | RP-46 | RP-091262 | 444R1 |  |  | PCMAX definition | 9.2.0 |
| 03-2010 | RP-47 | RP-100246 | 453r1 |  |  | Corrections of various errors in the UE RF requirements | 9.3.0 |
| 03-2010 | RP-47 | RP-100246 | 462r1 |  |  | UTRA ACLR measurement bandwidths for 1.4 and 3 MHz | 9.3.0 |
| 03-2010 | RP-47 | RP-100246 | 493 |  |  | Band 8 Coexistence Requirement Table Correction | 9.3.0 |
| 03-2010 | RP-47 | RP-100246 | 489r1 |  |  | Rel 9 CR for Band 14 | 9.3.0 |
| 03-2010 | RP-47 | RP-100246 | 485r1 |  |  | CR Band 1- PHS coexistence | 9.3.0 |
| 03-2010 | RP-47 | RP-100247 | 501 |  |  | Fading CQI requirements for FDD mode | 9.3.0 |
| 03-2010 | RP-47 | RP-100247 | 499 |  |  | CR correction to RI test | 9.3.0 |
| 03-2010 | RP-47 | RP-100249 | 451 |  |  | Reporting mode, Reporting Interval and Editorial corrections for demodulation | 9.3.0 |
| 03-2010 | RP-47 | RP-100249 | 464r1 |  |  | Corrections to 1PRB PDSCH performance test in presence of MBSFN. | 9.3.0 |
| 03-2010 | RP-47 | RP-100249 | 458r1 |  |  | OCNG corrections | 9.3.0 |
| 03-2010 | RP-47 | RP-100249 | 467 |  |  | Addition of ONCG configuration in DRS performance test | 9.3.0 |
| 03-2010 | RP-47 | RP-100249 | 465r1 |  |  | PDSCH performance tests for low UE categories | 9.3.0 |
| 03-2010 | RP-47 | RP-100250 | 460r1 |  |  | Use of OCNG in CSI tests | 9.3.0 |
| 03-2010 | RP-47 | RP-100250 | 491r1 |  |  | Corrections to CQI test configurations | 9.3.0 |
| 03-2010 | RP-47 | RP-100250 | 469r1 |  |  | Corrections of some CSI test parameters | 9.3.0 |
| 03-2010 | RP-47 | RP-100251 | 456r1 |  |  | TBS correction for RMC UL TDD 16QAM full allocation BW 1.4 MHz | 9.3.0 |
| 03-2010 | RP-47 | RP-100262 | 449 |  |  | Editorial corrections on Band 19 REFSENS | 9.3.0 |
| 03-2010 | RP-47 | RP-100263 | 470r1 |  |  | Band 20 UE RF requirements | 9.3.0 |
| 03-2010 | RP-47 | RP-100264 | 446r1 |  |  | A-MPR for Band 21 | 9.3.0 |
| 03-2010 | RP-47 | RP-100264 | 448 |  |  | RF requirements for UE in later releases | 9.3.0 |
| 03-2010 | RP-47 | RP-100268 | 445 |  |  | 36.101 CR: Editorial corrections on LTE MBMS reference measurement channels | 9.3.0 |
| 03-2010 | RP-47 | RP-100268 | 454 |  |  | The definition of the Doppler shift for LTE MBSFN Channel Model | 9.3.0 |
| 03-2010 | RP-47 | RP-100239 | 478r3 |  |  | Modification of the spectral flatness requirement and some editorial corrections | 9.3.0 |
| 06-2010 | RP-48 | RP-100619 | 559 |  |  | Corrections of tables for Additional Spectrum Emission Mask | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 538 |  |  | Correction of transient time definition for EVM requirements | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 557r2 |  |  | CR on UE coexistence requirement | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 547r1 |  |  | Correction of antenna configuration and beam-forming model for DRS | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 536r1 |  |  | CR: Corrections on MIMO demodulation performance requirements | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 528r1 |  |  | Corrections on the definition of PCMAX | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 568 |  |  | Relaxation of the PDSCH demodulation requirements due to control channel errors | 9.4.0 |
| 06-2010 | RP-48 | RP-100619 | 566 |  |  | Correction of the UE output power definition for RX tests | 9.4.0 |
| 06-2010 | RP-48 | RP-100620 | 505r1 |  |  | Fading CQI requirements for TDD mode | 9.4.0 |
| 06-2010 | RP-48 | RP-100620 | 521 |  |  | Correction to FRC for CQI index 0 | 9.4.0 |
| 06-2010 | RP-48 | RP-100620 | 516r1 |  |  | Correction to CQI test configuration | 9.4.0 |
| 06-2010 | RP-48 | RP-100620 | 532 |  |  | Correction of CQI and PMI delay configuration description for TDD | 9.4.0 |
| 06-2010 | RP-48 | RP-100620 | 574 |  |  | Correction to FDD and TDD CSI test configurations | 9.4.0 |
| 06-2010 | RP-48 | RP-100620 | 571 |  |  | Minimum requirements for Rank indicator reporting | 9.4.0 |
| 06-2010 | RP-48 | RP-100628 | 563 |  |  | LTE MBMS performance requirements (FDD) | 9.4.0 |
| 06-2010 | RP-48 | RP-100628 | 564 |  |  | LTE MBMS performance requirements (TDD) | 9.4.0 |
| 06-2010 | RP-48 | RP-100629 | 553r2 |  |  | Performance requirements for dual-layer beamforming | 9.4.0 |
| 06-2010 | RP-48 | RP-100630 | 524r2 |  |  | CR: low Category CSI requirement | 9.4.0 |
| 06-2010 | RP-48 | RP-100630 | 519 |  |  | Correction of FRC reference and test case numbering | 9.4.0 |
| 06-2010 | RP-48 | RP-100630 | 526 |  |  | Correction of carrier frequency and EARFCN of Band 21 for TS36.101 | 9.4.0 |
| 06-2010 | RP-48 | RP-100630 | 508r1 |  |  | Addition of PDSCH TDD DRS demodulation tests for Low UE categories | 9.4.0 |
| 06-2010 | RP-48 | RP-100630 | 539 |  |  | Specification of minimum performance requirements for low UE category | 9.4.0 |
| 06-2010 | RP-48 | RP-100630 | 569 |  |  | Addition of minimum performance requirements for low UE category TDD CRS single-antenna port tests | 9.4.0 |
| 06-2010 | RP-48 | RP-100631 | 549r3 |  |  | Introduction of sustained downlink data-rate performance requirements | 9.4.0 |
| 06-2010 | RP-48 | RP-100683 | 530r1 |  |  | Band 20 Rx requirements | 9.4.0 |
| 09-2010 | RP-49 | RP-100920 | 614r2 |  |  | Add OCNG to MBMS requirements | 9.5.0 |
| 09-2010 | RP-49 | RP-100916 | 599 |  |  | Correction of PDCCH content for PHICH test | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 597r1 |  |  | Beamforming model for transmission on antenna port 7/8 | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 600r1 |  |  | Correction of full correlation in frequency-selective CQI test | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 601 |  |  | Correction on single-antenna transmission fixed reference channel | 9.5.0 |
| 09-2010 | RP-49 | RP-100914 | 605 |  |  | Reference sensitivity requirements for the 1.4 and 3 MHz bandwidths | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 608r1 |  |  | CR for DL sustained data rate test | 9.5.0 |
| 09-2010 | RP-49 | RP-100919 | 611 |  |  | Correction of references in section 10 (MBMS performance requirements) | 9.5.0 |
| 09-2010 | RP-49 | RP-100914 | 613 |  |  | Band 13 and Band 14 spurious emission corrections | 9.5.0 |
| 09-2010 | RP-49 | RP-100919 | 617r1 |  |  | Rx Requirements | 9.5.0 |
| 09-2010 | RP-49 | RP-100926 | 576r1 |  |  | Clarification on DL-BF simulation assumptions | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 582r1 |  |  | Introduction of additional Rel-9 scenarios | 9.5.0 |
| 09-2010 | RP-49 | RP-100925 | 575r1 |  |  | Correction to band 20 ue to ue Co-existence table | 9.5.0 |
| 09-2010 | RP-49 | RP-100916 | 581r1 |  |  | Test configuration corrections to CQI reporting in AWGN | 9.5.0 |
| 09-2010 | RP-49 | RP-100916 | 595 |  |  | Corrections to RF OCNG Pattern OP.1 and 2 | 9.5.0 |
| 09-2010 | RP-49 | RP-100919 | 583 |  |  | Editorial corrections of 36.101 | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 586 |  |  | Addition of minimum performance requirements for low UE category TDD tests | 9.5.0 |
| 09-2010 | RP-49 | RP-100914 | 590r1 |  |  | Downlink power for receiver tests | 9.5.0 |
| 09-2010 | RP-49 | RP-100920 | 591 |  |  | OCNG use and power in beamforming tests | 9.5.0 |
| 09-2010 | RP-49 | RP-100916 | 593 |  |  | Throughput for multi-datastreams transmissions | 9.5.0 |
| 09-2010 | RP-49 | RP-100914 | 588 |  |  | Missing note in Additional spurious emission test with NS\_07 | 9.5.0 |
| 09-2010 | RP-49 | RP-100927 | 596r2 |  |  | CR LTE\_TDD\_2600\_US spectrum band definition additions to TS 36.101 | 10.0.0 |
| 12-2010 | RP-50 | RP-101309 | 680 |  |  | Demodulation performance requirements for dual-layer beamforming | 10.1.0 |
| 12-2010 | RP-50 | RP-101325 | 672 |  |  | Correction on the statement of TB size and subband selection in CSI tests | 10.1.0 |
| 12-2010 | RP-50 | RP-101327 | 652 |  |  | Correction to Band 12 frequency range | 10.1.0 |
| 12-2010 | RP-50 | RP-101329 | 630 |  |  | Removal of [ ] from TDD Rank Indicator requirements | 10.1.0 |
| 12-2010 | RP-50 | RP-101329 | 635r1 |  |  | Test configuration corrections to CQI TDD reporting in AWGN (Rel-10) | 10.1.0 |
| 12-2010 | RP-50 | RP-101330 | 645 |  |  | EVM window length for PRACH | 10.1.0 |
| 12-2010 | RP-50 | RP-101330 | 649 |  |  | Removal of NS signalling from TDD REFSENS tests | 10.1.0 |
| 12-2010 | RP-50 | RP-101330 | 642r1 |  |  | Correction of Note 4 In Table 7.3.1-1: Reference sensitivity QPSK PREFSENS | 10.1.0 |
| 12-2010 | RP-50 | RP-101341 | 627 |  |  | Add 20 RB UL Ref Meas channel | 10.1.0 |
| 12-2010 | RP-50 | RP-101341 | 654r1 |  |  | Additional in-band blocking requirement for Band 12 | 10.1.0 |
| 12-2010 | RP-50 | RP-101341 | 678 |  |  | Further clarifications for the Sustained Downlink Data Rate Test | 10.1.0 |
| 12-2010 | RP-50 | RP-101341 | 673r1 |  |  | Correction on MBMS performance requirements | 10.1.0 |
| 12-2010 | RP-50 | RP-101349 | 667r3 |  |  | CR Removing brackets of Band 41 reference sensitivity to TS 36.101 | 10.1.0 |
| 12-2010 | RP-50 | RP-101356 | 666r2 |  |  | Band 42 and 43 parameters for UMTS/LTE 3500 (TDD) for TS 36.101 | 10.1.0 |
| 12-2010 | RP-50 | RP-101359 | 646r1 |  |  | CR for CA, UL-MIMO, eDL-MIMO, CPE | 10.1.0 |
| 12-2010 | RP-50 | RP-101361 | 620r1 |  |  | Introduction of L-band in TS 36.101 | 10.1.0 |
| 12-2010 | RP-50 | RP-101379 | 670r1 |  |  | Correction on the PMI reporting in Multi-Laye Spatial Multiplexing performance test | 10.1.0 |
| 12-2010 | RP-50 | RP-101380 | 679r1 |  |  | Adding antenna configuration in CQI fading test case | 10.1.0 |
| 01-2011 |  |  |  |  |  | Clause numbering correction | 10.1.1 |
| 03-2011 | RP-51 | RP-110359 | 695 |  |  | Removal of E-UTRA ACLR for CA | 10.2.0 |
| 03-2011 | RP-51 | RP-110338 | 699 |  |  | PDCCH and PHICH performance: OCNG and power settings | 10.2.0 |
| 03-2011 | RP-51 | RP-110336 | 706r1 |  |  | Spurious emissions measurement uncertainty | 10.2.0 |
| 03-2011 | RP-51 | RP-110352 | 707r1 |  |  | REFSENSE in lower SNR | 10.2.0 |
| 03-2011 | RP-51 | RP-110338 | 710 |  |  | PMI performance: Power settings and precoding granularity | 10.2.0 |
| 03-2011 | RP-51 | RP-110359 | 715r2 |  |  | Definition of configured transmitted power for Rel-10 | 10.2.0 |
| 03-2011 | RP-51 | RP-110359 | 717 |  |  | Introduction of requirement for adjacent intraband CA image rejection | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 719 |  |  | Minimum requirements for the additional Rel-9 scenarios | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 723 |  |  | Corrections to power settings for Single layer beamforming with simultaneous transmission | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 726r1 |  |  | Correction to the PUSCH3-0 subband tests for Rel-10 | 10.2.0 |
| 03-2011 | RP-51 | RP-110338 | 730 |  |  | Removing the square bracket for TS36.101 | 10.2.0 |
| 03-2011 | RP-51 | RP-110349 | 739 |  |  | Removal of square brackets for dual-layer beamforming demodulation performance requirements | 10.2.0 |
| 03-2011 | RP-51 | RP-110359 | 751 |  |  | CR: Maximum input level for intra band CA | 10.2.0 |
| 03-2011 | RP-51 | RP-110349 | 754r2 |  |  | UE category coverage for dual-layer beamforming | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 756r1 |  |  | Further clarifications for the Sustained Downlink Data Rate Test | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 759 |  |  | Removal of square brackets in sustained data rate tests | 10.2.0 |
| 03-2011 | RP-51 | RP-110337 | 762r1 |  |  | Clarification to LTE relative power tolerance table | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 764 |  |  | Introducing UE-selected subband CQI tests | 10.2.0 |
| 03-2011 | RP-51 | RP-110343 | 765 |  |  | Verification framework for PUSCH 2-2 and PUCCH 2-1 reporting | 10.2.0 |
| 04-2011 |  |  |  |  |  | Editorial: Spec Title correction, removal of “Draft” | 10.2.1 |
| 06-2011 | RP-52 | RP-110804 | 766 |  |  | Add Expanded 1900MHz Band (Band 25) in 36.101 | 10.3.0 |
| 06-2011 | RP-52 | RP-110795 | 768 |  |  | Fixing Band 24 inclusion in TS 36.101 | 10.3.0 |
| 06-2011 | RP-52 | RP-110788 | 772 |  |  | CR: Corrections for UE to UE co-existence requirements of Band 3 | 10.3.0 |
| 06-2011 | RP-52 | RP-110812 | 774 |  |  | Add 2GHz S-Band (Band 23) in 36.101 | 10.3.0 |
| 06-2011 | RP-52 | RP-110789 | 782 |  |  | CR: Band 19 A-MPR refinement | 10.3.0 |
| 06-2011 | RP-52 | RP-110796 | 787 |  |  | REFSENS in lower SNR | 10.3.0 |
| 06-2011 | RP-52 | RP-110789 | 805 |  |  | Clarification for MBMS reference signal levels | 10.3.0 |
| 06-2011 | RP-52 | RP-110792 | 810 |  |  | FDD MBMS performance requirements for 64QAM mode | 10.3.0 |
| 06-2011 | RP-52 | RP-110787 | 814 |  |  | Correction on CQI mapping index of RI test | 10.3.0 |
| 06-2011 | RP-52 | RP-110789 | 824 |  |  | Corrections to in-band blocking table | 10.3.0 |
| 06-2011 | RP-52 | RP-110794 | 826 |  |  | Correction of TDD Category 1 DRS and DMRS RMCs | 10.3.0 |
| 06-2011 | RP-52 | RP-110794 | 828 |  |  | TDD MBMS performance requirements for 64QAM mode | 10.3.0 |
| 06-2011 | RP-52 | RP-110796 | 829 |  |  | Correction of TDD RMC for Low SNR Demodulation test | 10.3.0 |
| 06-2011 | RP-52 | RP-110796 | 830 |  |  | Informative reference sensitivity requirements for Low SNR for TDD | 10.3.0 |
| 06-2011 | RP-52 | RP-110787 | 778r1 |  |  | Minor corrections to DL-RMC-s for Maximum input level | 10.3.0 |
| 06-2011 | RP-52 | RP-110789 | 832 |  |  | PDCCH and PHICH performance: OCNG and power settings | 10.3.0 |
| 06-2011 | RP-52 | RP-110789 | 818r1 |  |  | Correction on 2-X PMI test for R10 | 10.3.0 |
| 06-2011 | RP-52 | RP-110791 | 816r1 |  |  | Addition of performance requirements for dual-layer beamforming category 1 UE test | 10.3.0 |
| 06-2011 | RP-52 | RP-110789 | 834 |  |  | Performance requirements for PUCCH 2-0, PUCCH 2-1 and PUSCH 2-2 tests | 10.3.0 |
| 06-2011 | RP-52 | RP-110807 | 835r1 |  |  | CR for UL MIMO and CA | 10.3.0 |
| 09-2011 | RP-53 | RP-111248 | 862r1 |  |  | Removal of unnecessary channel bandwidths from REFSENS tables | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 869r1 |  |  | Clarification on BS precoding information field for RI FDD and PUCCH 2-1 PMI tests | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 872r1 |  |  | CR for B14Rx requirement Rrel 10 | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 890r1 |  |  | CR to TS36.101: Correction on the accuracy test of CQI. | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 893 |  |  | CR to TS36.101: Correction on CQI mapping index of TDD RI test | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 904 |  |  | Correction of code block numbers for some RMCs | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 907 |  |  | Correction to UL RMC for FDD and TDD | 10.4.0 |
| 09-2011 | RP-53 | RP-111248 | 914r1 |  |  | Adding codebook subset restriction for single layer closed-loop spatial multiplexing test | 10.4.0 |
| 09-2011 | RP-53 | RP-111251 | 883 |  |  | Sustained data rate: Correction of the ACK/NACK feedback mode | 10.4.0 |
| 09-2011 | RP-53 | RP-111251 | 929 |  |  | 36.101 CR on MBSFN FDD requirements(R10) | 10.4.0 |
| 09-2011 | RP-53 | RP-111251 | 938 |  |  | TDD MBMS performance requirements for 64QAM mode | 10.4.0 |
| 09-2011 | RP-53 | RP-111252 | 895 |  |  | Further clarification for the dual-layer beamforming demodulation requirements | 10.4.0 |
| 09-2011 | RP-53 | RP-111255 | 908r1 |  |  | Introduction of Band 22 | 10.4.0 |
| 09-2011 | RP-53 | RP-111255 | 939 |  |  | Modifications of Band 42 and 43 | 10.4.0 |
| 09-2011 | RP-53 | RP-111260 | 944 |  |  | CR for TS 36.101 Annex B: Static channels for CQI tests | 10.4.0 |
| 09-2011 | RP-53 | RP-111262 | 878r1 |  |  | Correction of CSI reference channel subframe description | 10.4.0 |
| 09-2011 | RP-53 | RP-111262 | 887 |  |  | Correction to UL MIMO | 10.4.0 |
| 09-2011 | RP-53 | RP-111262 | 926r1 |  |  | Power control accuracy for intra-band carrier aggregation | 10.4.0 |
| 09-2011 | RP-53 | RP-111262 | 927r1 |  |  | In-band emissions requirements for intra-band carrier aggregation | 10.4.0 |
| 09-2011 | RP-53 | RP-111262 | 930r1 |  |  | Adding the operating band for UL-MIMO | 10.4.0 |
| 09-2011 | RP-53 | RP-111265 | 848 |  |  | Corrections to intra-band contiguous CA RX requirements | 10.4.0 |
| 09-2011 | RP-53 | RP-111265 | 863 |  |  | Intra-band contiguos CA MPR requirement refinement | 10.4.0 |
| 09-2011 | RP-53 | RP-111265 | 866r1 |  |  | Intra-band contiguous CA EVM | 10.4.0 |
| 09-2011 | RP-53 | RP-111266 | 935 |  |  | Introduction of the downlink CA demodulation requirements | 10.4.0 |
| 09-2011 | RP-53 | RP-111266 | 936r1 |  |  | Introduction of CA UE demodulation requirements for TDD | 10.4.0 |
| 12-2011 | RP-54 | RP-111684 | 947 |  |  | Corrections of UE categories of Rel-10 reference channels for RF requirements | 10.5.0 |
| 12-2011 | RP-54 | RP-111684 | 948 |  |  | Alternative way to define channel bandwidths per operating band for | 10.5.0 |
| 12-2011 | RP-54 | RP-111686 | 949 |  |  | CR for TS36.101: Adding note to the function of MPR | 10.5.0 |
| 12-2011 | RP-54 | RP-111680 | 950 |  |  | Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 | 10.5.0 |
| 12-2011 | RP-54 | RP-111734 | 953r1 |  |  | Corrections for Band 42 and 43 introduction | 10.5.0 |
| 12-2011 | RP-54 | RP-111680 | 956 |  |  | UE spurious emissions | 10.5.0 |
| 12-2011 | RP-54 | RP-111682 | 959 |  |  | Add scrambling identity n\_SCID for MU-MIMO test | 10.5.0 |
| 12-2011 | RP-54 | RP-111690 | 960r1 |  |  | P-MPR definition | 10.5.0 |
| 12-2011 | RP-54 | RP-111693 | 962 |  |  | Pcmax,c Computation Assumptions | 10.5.0 |
| 12-2011 | RP-54 | RP-111733 | 963r1 |  |  | Correction of frequency range for spurious emission requirements | 10.5.0 |
| 12-2011 | RP-54 | RP-111680 | 966 |  |  | General review of the reference measurement channels | 10.5.0 |
| 12-2011 | RP-54 | RP-111691 | 945 |  |  | Corrections of Rel-10 demodulation performance requirements  This CR is only partially implemented due to confliction with CR 966 | 10.5.0 |
| 12-2011 | RP-54 | RP-111684 | 946 |  |  | Corrections of UE categories for Rel-10 CSI requirements  This CR is only partially implemented due to confliction with CR 966 | 10.5.0 |
| 12-2011 | RP-54 | RP-111691 | 982r2 |  |  | Introduction of SDR TDD test scenario for CA UE demodulation  This CR is only partially implemented due to confliction with CR 966 | 10.5.0 |
| 12-2011 | RP-54 | RP-111693 | 971r1 |  |  | CR on Colliding CRS for non-MBSFN ABS | 10.5.0 |
| 12-2011 | RP-54 | RP-111693 | 972r1 |  |  | Introduction of eICIC demodulation performance requirements for FDD and TDD | 10.5.0 |
| 12-2011 | RP-54 | RP-111686 | 985 |  |  | Adding missing UL configuration specification in some UE receiver requirements for case of 1 CC UL capable UE | 10.5.0 |
| 12-2011 | RP-54 | RP-111684 | 998 |  |  | Correction and maintenance on CQI and PMI requirements (Rel-10) | 10.5.0 |
| 12-2011 | RP-54 | RP-111735 | 1004 |  |  | MPR for CA Multi-cluster | 10.5.0 |
| 12-2011 | RP-54 | RP-111691 | 1005 |  |  | CA demodulation performance requirements for LTE FDD | 10.5.0 |
| 12-2011 | RP-54 | RP-111692 | 1006 |  |  | CQI reporting accuracy test on frequency non-selective scheduling on eDL MIMO | 10.5.0 |
| 12-2011 | RP-54 | RP-111692 | 1007 |  |  | CQI reporting accuracy test on frequency-selective scheduling on eDL MIMO | 10.5.0 |
| 12-2011 | RP-54 | RP-111692 | 1008 |  |  | PMI reporting accuracy test for TDD on eDL MIMO | 10.5.0 |
| 12-2011 | RP-54 | RP-111692 | 1009r1 |  |  | CR for TS 36.101: RI performance requirements | 10.5.0 |
| 12-2011 | RP-54 | RP-111692 | 1010r1 |  |  | CR for TS 36.101: Introduction of static CQI tests (Rel-10) | 10.5.0 |
| 03-2012 | RP-55 | RP-120291 | 1014 |  |  | RF: Updates and corrections to the RMC-s related annexes (Rel-10) | 10.6.0 |
| 03-2012 | RP-55 | RP-120300 | 1015r1 |  |  | On eICIC ABS pattern | 10.6.0 |
| 03-2012 | RP-55 | RP-120300 | 1016r1 |  |  | On eICIC interference models | 10.6.0 |
| 03-2012 | RP-55 | RP-120299 | 1017r1 |  |  | TS36.101 CR: on eDL-MIMO channel model using cross-polarized antennas | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1020r1 |  |  | TS36.101 CR: Correction to MBMS Performance Test Parameters | 10.6.0 |
| 03-2012 | RP-55 | RP-120303 | 1021 |  |  | Harmonic exceptions in LTE UE to UE co-ex tests | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1023 |  |  | Unified titles for Rel-10 CSI tests | 10.6.0 |
| 03-2012 | RP-55 | RP-120300 | 1033r1 |  |  | Introduction of reference channel for eICIC demodulation | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1040r1 |  |  | Correction of Actual code rate for CSI RMCs | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1041r1 |  |  | Definition of synchronized operation | 10.6.0 |
| 03-2012 | RP-55 | RP-120296 | 1048r1 |  |  | Intra band contiguos CA Ue to Ue Co-ex | 10.6.0 |
| 03-2012 | RP-55 | RP-120296 | 1049r1 |  |  | REL-10 CA specification editorial consistency | 10.6.0 |
| 03-2012 | RP-55 | RP-120299 | 1053 |  |  | Beamforming model for TM9 | 10.6.0 |
| 03-2012 | RP-55 | RP-120296 | 1054 |  |  | Requirement for CA demodulation with power imbalance | 10.6.0 |
| 03-2012 | RP-55 | RP-120298 | 1057 |  |  | Updating Band 23 duplex specifications | 10.6.0 |
| 03-2012 | RP-55 | RP-120298 | 1058r1 |  |  | Correcting UE Coexistence Requirements for Band 23 | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1059r1 |  |  | CA demodulation performance requirements for LTE TDD | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1061 |  |  | Requirement for CA SDR FDD test scenario | 10.6.0 |
| 03-2012 | RP-55 | RP-120293 | 1064r1 |  |  | TS36.101 RF editorial corrections Rel 10 | 10.6.0 |
| 03-2012 | RP-55 | RP-120299 | 1067r1 |  |  | Introduction of TM9 demodulation performance requirements | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1071r1 |  |  | Introduction of a CA demodulation test for UE soft buffer management testing | 10.6.0 |
| 03-2012 | RP-55 | RP-120296 | 1072 |  |  | MPR formula correction For intra-band contiguous CA Bandwidth Class C | 10.6.0 |
| 03-2012 | RP-55 | RP-120303 | 1077r1 |  |  | CR for 36.101: B41 REFSENS and MOP changes to accommodate single filter architecture | 10.6.0 |
| 03-2012 | RP-55 | RP-120300 | 1082 |  |  | TM3 tests for eICIC | 10.6.0 |
| 03-2012 | RP-55 | RP-120300 | 1083r1 |  |  | Introduction of requirements of CQI reporting definition for ecICIC | 10.6.0 |
| 03-2012 | RP-55 | RP-120304 | 1084 |  |  | eDL MIMO CSI requirements | 10.6.0 |
| 03-2012 | RP-55 | RP-120306 | 1070r1 |  |  | Introduction of Band 26/XXVI to TS 36.101 | 11.0.0 |
| 03-2012 | RP-55 | RP-120310 | 1074 |  |  | Band 41 CA CR for TS36.101, section 5 | 11.0.0 |
| 03-2012 | RP-55 | RP-120310 | 1075r1 |  |  | Band 41 CA CR for TS36.101, section 6 | 11.0.0 |
| 03-2012 | RP-55 | RP-120310 | 1076 |  |  | Band 41 CA CR for TS36.101, section 7 | 11.0.0 |
| 06-2012 | RP-56 | RP-120795 | 1085r2 |  |  | Modulator specification tightening | 11.1.0 |
| 06-2012 | RP-56 | RP-120777 | 1087r1 |  |  | Carrier aggregation Relative power tolerance, removal of TBD. | 11.1.0 |
| 06-2012 | RP-56 | RP-120783 | 1089 |  |  | UE spurious emissions for Band 7 and Band 38 coexistence | 11.1.0 |
| 06-2012 | RP-56 | RP-120780 | 1092 |  |  | Deleting square brackets in Reference Measurement Channels | 11.1.0 |
| 06-2012 | RP-56 | RP-120779 | 1097 |  |  | CR to TS36.101: Correction on parameters for the eDL-MIMO CQI and PMI tests | 11.1.0 |
| 06-2012 | RP-56 | RP-120780 | 1098r1 |  |  | CR to TS36.101: Fixed reference channel for PDSCH demodulation performance requirements on eDL-MIMO – NOT implemented as it is based on a wrong version of the spec | 11.1.0 |
| 06-2012 | RP-56 | RP-120774 | 1107 |  |  | RMC correction on eDL-MIMO RI test | 11.1.0 |
| 06-2012 | RP-56 | RP-120774 | 1108r1 |  |  | FRC correction on frequency selective CQI and PMI test (Rel-11) | 11.1.0 |
| 06-2012 | RP-56 | RP-120774 | 1111 |  |  | Correction on test point for PMI test (Rel-11) | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1114r1 |  |  | Corrections and clarifications on eICIC demodulation test | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1117r1 |  |  | Corrections and clarifications on eICIC CSI tests | 11.1.0 |
| 06-2012 | RP-56 | RP-120783 | 1119r1 |  |  | Corrections on UE performance requirements | 11.1.0 |
| 06-2012 | RP-56 | RP-120773 | 1120 |  |  | Introduction of CA band combination Band1 + Band19 to TS 36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120769 | 1127 |  |  | Addition of ETU30 channel model | 11.1.0 |
| 06-2012 | RP-56 | RP-120773 | 1140 |  |  | Addition of Maximum Throughput for R.30-1 TDD RMC | 11.1.0 |
| 06-2012 | RP-56 | RP-120779 | 1141 |  |  | CR for 36.101: The clarification of MPR and A-MPR for CA | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1142 |  |  | Corrections for eICIC demod test case with MBSN ABS | 11.1.0 |
| 06-2012 | RP-56 | RP-120785 | 1144 |  |  | Removing brackets of contiguous allocation A-MPR for CA\_NS\_04 | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1149r1 |  |  | Introduction of PDCCH test with colliding RS on MBSFN-ABS | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1153r1 |  |  | Some clarifications and OCNG pattern for eICIC demodulation requirements | 11.1.0 |
| 06-2012 | RP-56 | RP-120773 | 1155 |  |  | Introduction of TDD CA Soft Buffer Limitation | 11.1.0 |
| 06-2012 | RP-56 | RP-120795 | 1156 |  |  | B26 and other editorial corrections | 11.1.0 |
| 06-2012 | RP-56 | RP-120779 | 1161 |  |  | Corrections on CQI and PMI test | 11.1.0 |
| 06-2012 | RP-56 | RP-120780 | 1163 |  |  | FRC for TDD PMI test | 11.1.0 |
| 06-2012 | RP-56 | RP-120778 | 1165r1 |  |  | Clean-up of UL-MIMO for TS36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120782 | 1171 |  |  | Removal of unnecessary references to single carrier requirements from Interband CA subclauses | 11.1.0 |
| 06-2012 | RP-56 | RP-120781 | 1174 |  |  | PDCCH wrong detection in receiver spurious emissions test | 11.1.0 |
| 06-2012 | RP-56 | RP-120776 | 1184 |  |  | Corrections to 3500 MHz | 11.1.0 |
| 06-2012 | RP-56 | RP-120793 | 1189r2 |  |  | Introduction of Band 44 | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1193r1 |  |  | Target SNR setting for eICIC demodulation requirement | 11.1.0 |
| 06-2012 | RP-56 | RP-120780 | 1196 |  |  | Editorial simplification to CA REFSENS UL allocation table | 11.1.0 |
| 06-2012 | RP-56 | RP-120778 | 1199 |  |  | Correction of wrong table refernces in CA receiver tests | 11.1.0 |
| 06-2012 | RP-56 | RP-120791 | 1200r1 |  |  | Introduction of e850\_LB (Band 27) to TS 36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120764 | 1212 |  |  | Correction of PHS protection requirements for TS 36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120793 | 1213r1 |  |  | Introduction of Band 28 into TS36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120781 | 1215r1 |  |  | Proposed revision of subclause 4.3A for TS36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120781 | 1217r1 |  |  | Proposed revision on subclause 6.3.4A for TS36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120795 | 1219r1 |  |  | Aligning requirements between Band 18 and Band 26 in TS36.101 | 11.1.0 |
| 06-2012 | RP-56 | RP-120782 | 1221 |  |  | SNR definition | 11.1.0 |
| 06-2012 | RP-56 | RP-120778 | 1223 |  |  | Correction of CSI configuraiton for CA TM4 tests R11 | 11.1.0 |
| 06-2012 | RP-56 | RP-120773 | 1225 |  |  | CR on CA UE receiver timing window R11 | 11.1.0 |
| 06-2012 | RP-56 | RP-120784 | 1226 |  |  | Extension of static eICIC CQI test | 11.1.0 |
| 09-2012 | RP-57 | RP-121294 | 1230 |  |  | Correct Transport Block size in 9RB 16QAM Uplink Reference Measurement Channel | 11.2.0 |
| 09-2012 | RP-57 | RP-121313 | 1233r1 |  |  | RF: Corrections to power allocation parameters for transmission mode 8 (Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1235 |  |  | RF-CA: non-CA notation and applicability of test points in scenarios without and with CA operation (Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121305 | 1237 |  |  | ACK/NACK feedback modes for FDD and TDD TM4 CA demodulation requirements (Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121305 | 1239 |  |  | Correction of feedback mode for CA TDD demodulation requirements (resubmission of R4-63AH-0194 for Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121302 | 1241 |  |  | ABS pattern setup for MBSFN ABS test (resubmission of R4-63AH-0204 for Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121302 | 1243 |  |  | CR on eICIC CQI definition test (resubmission of R4-63AH-0205 for Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121302 | 1245 |  |  | Transmission of CQI feedback and other corrections (Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121302 | 1247 |  |  | Target SNR setting for eICIC MBSFN-ABS demodulation requirements (Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121335 | 1248 |  |  | Introduction of CA\_1\_21 RF requirements into TS36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121300 | 1251 |  |  | Corrections of spurious emission band UE co-existence applicable in Japan | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1253 |  |  | Correction on RMC for frequency non-selective CQI test | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1255 |  |  | Requirements for the eDL-MIMO CQI test | 11.2.0 |
| 09-2012 | RP-57 | RP-121302 | 1257 |  |  | Clarification on PDSCH test setup under MBSFN ABS | 11.2.0 |
| 09-2012 | RP-57 | RP-121316 | 1258 |  |  | Update of Band 28 requirements | 11.2.0 |
| 09-2012 | RP-57 | RP-121313 | 1262 |  |  | Applicabilty of statement allowing RBW < Meas BW for spurious | 11.2.0 |
| 09-2012 | RP-57 | RP-121298 | 1265 |  |  | Clarification of RB allocation for DRS demodulation tests | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1267 |  |  | Removal of brackets for CA Tx | 11.2.0 |
| 09-2012 | RP-57 | RP-121337 | 1268r1 |  |  | TS 36.101 CR for CA\_38 | 11.2.0 |
| 09-2012 | RP-57 | RP-121327 | 1269 |  |  | Introduction of CA\_B7\_B20 in 36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121313 | 1271 |  |  | Corrections of FRC subframe allocations and other minor problems | 11.2.0 |
| 09-2012 | RP-57 | RP-121305 | 1274 |  |  | Introduction of requirements for TDD CA Soft Buffer Limitation | 11.2.0 |
| 09-2012 | RP-57 | RP-121307 | 1276 |  |  | Correction of eDL-MIMIO CSI RMC tables and references | 11.2.0 |
| 09-2012 | RP-57 | RP-121307 | 1278 |  |  | Correction of MIMO channel model for polarized antennas | 11.2.0 |
| 09-2012 | RP-57 | RP-121303 | 1280 |  |  | Addition of 15 and 20MHz Bandwidths for Band 23 to TS 36.101 (Rel-11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121334 | 1283r1 |  |  | Add requirements for inter-band CA of B\_1-18 and B\_11-18 in TS36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1285r1 |  |  | CR for MPR mask for multi-clustered simultaneous transmission in single CC in Rel-11 | 11.2.0 |
| 09-2012 | RP-57 | RP-121447 | 1288r2 |  |  | Introduction of Japanese Regulatory Requirements to LTE Band 8(R11) | 11.2.0 |
| 09-2012 | RP-57 | RP-121315 | 1289 |  |  | CR for Band 27 MOP | 11.2.0 |
| 09-2012 | RP-57 | RP-121315 | 1290 |  |  | CR for Band 27 A-MPR | 11.2.0 |
| 09-2012 | RP-57 | RP-121316 | 1291 |  |  | CR to replace protected frequency range with new band number 27 | 11.2.0 |
| 09-2012 | RP-57 | RP-121215 | 1292r1 |  |  | Introduction of CA band combination Band3 + Band5 to TS 36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1300r1 |  |  | Requirements for eDL-MIMO RI test | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1304 |  |  | Corrections to TM9 demodulation tests | 11.2.0 |
| 09-2012 | RP-57 | RP-121313 | 1306 |  |  | Correction to PCFICH power parameter setting | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1310r1 |  |  | Correction on frequency non-selective CQI test | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1313r1 |  |  | eDL-MIMO CQI/PMI test | 11.2.0 |
| 09-2012 | RP-57 | RP-121313 | 1316 |  |  | Correction of the definition of unsynchronized operation | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1320r1 |  |  | Correction to Transmit Modulation Quality Tests for Intra-Band CA | 11.2.0 |
| 09-2012 | RP-57 | RP-121338 | 1324r2 |  |  | 36.101 CR for LTE\_CA\_B7 | 11.2.0 |
| 09-2012 | RP-57 | RP-121331 | 1325 |  |  | Introduction of CA\_3\_20 RF requirements into TS36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121316 | 1326 |  |  | A-MPR table correction for NS\_18 | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1332r1 |  |  | Bandwidth combination sets for intra-band and inter-band carrier aggregation | 11.2.0 |
| 09-2012 | RP-57 | RP-121325 | 1339 |  |  | Introduction of LTE Advanced Carrier Aggregation of Band 4 and Band 13 | 11.2.0 |
| 09-2012 | RP-57 | RP-121326 | 1340r1 |  |  | Introduction of CA configurations CA-12A-4A and CA-17A-4A | 11.2.0 |
| 09-2012 | RP-57 | RP-121324 | 1341 |  |  | Introduction of CA\_B3\_B7 in 36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121328 | 1343 |  |  | Introduction of Band 2 + Band 17 inter-band CA configuration into 36.101 | 11.2.0 |
| 09-2012 | RP-57 | RP-121306 | 1351 |  |  | FRC for TM9 FDD | 11.2.0 |
| 09-2012 | RP-57 | RP-121295 | 1352 |  |  | Random precoding granularity in PMI tests | 11.2.0 |
| 09-2012 | RP-57 | RP-121302 | 1358 |  |  | Introduction of RI test for eICIC | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1360 |  |  | Notes for deltaTib and deltaRib tables | 11.2.0 |
| 09-2012 | RP-57 | RP-121304 | 1361 |  |  | CR for A-MPR masks for NS\_CA\_1C | 11.2.0 |
| 12-2012 | RP-58 | RP-121884 | 1362 |  |  | Introduction of CA\_3\_8 RF requirements to TS 36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121870 | 1363 |  |  | Removal of square brackets for Band 27 in Table 5.6.1-1 | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1366 |  |  | Some changes related to CA tests and overview table of DL measurement channels | 11.3.0 |
| 12-2012 | RP-58 | RP-121860 | 1368 |  |  | Correction of eICIC CQI tests | 11.3.0 |
| 12-2012 | RP-58 | RP-121860 | 1370 |  |  | Correction of eICIC demodulation tests | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1374 |  |  | Correction on CSI-RS subframe offset parameter | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1376 |  |  | Correction on FRC table in CSI test | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1382 |  |  | Correction of reference channel table for TDD eDL-MIMIO RI test | 11.3.0 |
| 12-2012 | RP-58 | RP-121850 | 1386 |  |  | OCNG patterns for Sustained Data rate testing | 11.3.0 |
| 12-2012 | RP-58 | RP-121867 | 1388r1 |  |  | Introduction of one periodic CQI test for CA deployments | 11.3.0 |
| 12-2012 | RP-58 | RP-121894 | 1396 |  |  | Introduction of CA\_B5\_B12 in 36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121850 | 1401 |  |  | Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 | 11.3.0 |
| 12-2012 | RP-58 | RP-121887 | 1406r1 |  |  | Reference sensitivity for the small bandwidth of CA\_4-12 | 11.3.0 |
| 12-2012 | RP-58 | RP-121860 | 1407 |  |  | CR on eICIC RI test | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1409 |  |  | Cleaning of 36.101 Performance sections Rel-11 | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1416 |  |  | Out-of-band blocking requirements for inter-band carrier aggregation | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1418 |  |  | Adding missed SNR reference values for CA soft buffer tests | 11.3.0 |
| 12-2012 | RP-58 | RP-121890 | 1422 |  |  | Introduction of CA\_4A-5A into 36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121867 | 1431 |  |  | Clean up of specification R11 | 11.3.0 |
| 12-2012 | RP-58 | RP-121867 | 1436 |  |  | Band 1 to Band 33 and Band 39 UE coexistence requirements | 11.3.0 |
| 12-2012 | RP-58 | RP-121871 | 1437r1 |  |  | Editorial corrections for Band 26 | 11.3.0 |
| 12-2012 | RP-58 | RP-121896 | 1438 |  |  | Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1442 |  |  | Correction of eDL-MIMO RI test and RMC table for the CSI test | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1444 |  |  | Minor correction to ceiling function example - rel11 | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1449 |  |  | Correction of SNR definition | 11.3.0 |
| 12-2012 | RP-58 | RP-121860 | 1450 |  |  | Brackets clean up for eICIC CSI/demodulation | 11.3.0 |
| 12-2012 | RP-58 | RP-121860 | 1455 |  |  | CR on eICIC RI testing (Rel-11) | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1459 |  |  | Correction on FRC table | 11.3.0 |
| 12-2012 | RP-58 | RP-121879 | 1461r1 |  |  | CR for LTE B14 HPUE (Power Class 1 ) | 11.3.0 |
| 12-2012 | RP-58 | RP-121862 | 1464 |  |  | Adding references to the appropriate beamforming model (Rel-11) | 11.3.0 |
| 12-2012 | RP-58 | RP-121898 | 1465r1 |  |  | Introduction of CA\_8\_20 RF requirements into TS36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121882 | 1468r1 |  |  | Introduction of inter-band CA\_11-18 into TS36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121903 | 1472r1 |  |  | Introduction of advanced receivers demodulation performance (FDD) | 11.3.0 |
| 12-2012 | RP-58 | RP-121903 | 1473r1 |  |  | Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) | 11.3.0 |
| 12-2012 | RP-58 | RP-121886 | 1474 |  |  | CR to remove the square bracket of A-MPR in TS36.101 | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1476 |  |  | Correction of some errors in reference sensitivity for CA in TS 36.101 (R11) | 11.3.0 |
| 12-2012 | RP-58 | RP-121903 | 1480r1 |  |  | Introduction of Advanced Receivers Test Cases for TDD | 11.3.0 |
| 12-2012 | RP-58 | RP-121901 | 1490r1 |  |  | Introduction of Band 29 | 11.3.0 |
| 12-2012 | RP-58 | RP-121849 | 1494 |  |  | Low-channel Band 1 coexistence with PHS | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1498r1 |  |  | Completion of the tables of bandwidth combinations specified for CA | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1499r1 |  |  | Exceptions to REFSENS requrirements for class A2 CA combinations | 11.3.0 |
| 12-2012 | RP-58 | RP-121892 | 1500 |  |  | Introduction of carrier aggregation configuration CA\_4-7 | 11.3.0 |
| 12-2012 | RP-58 | RP-121870 | 1504 |  |  | Editorial corrections to Band 27 specifications | 11.3.0 |
| 12-2012 | RP-58 | RP-121878 | 1505 |  |  | Band 28 AMPR for DTV protection | 11.3.0 |
| 12-2012 | RP-58 | RP-121852 | 1509r1 |  |  | UE-UE coexistence between bands with small frequency separation | 11.3.0 |
| 12-2012 | RP-58 | RP-121911 | 1510 |  |  | Adding UE-UE Coexistence Requirement for Band 3 and Band 26 | 11.3.0 |
| 12-2012 | RP-58 | RP-121866 | 1513 |  |  | Maintenance of Band 23 UE Coexistence | 11.3.0 |
| 12-2012 | RP-58 | RP-121851 | 1515 |  |  | Corrections to TM4 rank indicator Test 3 | 11.3.0 |
| 12-2012 | RP-58 | RP-121861 | 1517 |  |  | Correction of test configuraitons and FRC for CA demodulation with power imbalance | 11.3.0 |
| 12-2012 | RP-58 | RP-121860 | 1518 |  |  | Applicable OFDM symbols of Noc\_2 for PDCCH/PCFICH ABS-MBSFN test cases | 11.3.0 |
| 03-2013 | RP-59 | RP-130279 | 1519 |  |  | OCNG patterns for Enhanced Performance Requirements Type A | 11.4.0 |
| 03-2013 | RP-59 | RP-130277 | 1520 |  |  | Corrections on in-band blocking for Band 29 for carrier aggregation | 11.4.0 |
| 03-2013 | RP-59 | RP-130268 | 1523 |  |  | Brackets removal in Rel-11 TM4 rank indicator Test 3 | 11.4.0 |
| 03-2013 | RP-59 | RP-130279 | 1524r1 |  |  | Cleanup of Advanced Receivers requirement scenarios for demodulation and CSI (FDD/TDD) | 11.4.0 |
| 03-2013 | RP-59 | RP-130258 | 1528 |  |  | Corrections to CQI reporting | 11.4.0 |
| 03-2013 | RP-59 | RP-130262 | 1536 |  |  | Corrections for eICIC performance requirements (rel-11) | 11.4.0 |
| 03-2013 | RP-59 | RP-130264 | 1539 |  |  | Correction of CA power imbalance performance requirements | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1543 |  |  | Correction of a symbol for MPR in single carrier for TS 36.101(R11) | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1544r1 |  |  | Correction of some inter-band CA requiements for TS 36.101 (R11) | 11.4.0 |
| 03-2013 | RP-59 | RP-130276 | 1546 |  |  | Correction of contigous allocation A-MPR for CA\_NS\_05 | 11.4.0 |
| 03-2013 | RP-59 | RP-130263 | 1547r1 |  |  | Clarification of spurious emission domain for CA in TS 36.101 (R11) | 11.4.0 |
| 03-2013 | RP-59 | RP-130264 | 1548 |  |  | CR for CA performance requirements | 11.4.0 |
| 03-2013 | RP-59 | RP-130284 | 1553r1 |  |  | Introduction of downlink non-contiguous CA into REL -11 TS 36.101 | 11.4.0 |
| 03-2013 | RP-59 | RP-130263 | 1557 |  |  | CA\_1C: CA\_NS\_02 and CA\_NS\_03 A-MPR REL-11 | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1560 |  |  | Editorial corrections to subclause 5 | 11.4.0 |
| 03-2013 | RP-59 | RP-130267 | 1562 |  |  | Addition of UE Regional Requirements to Band 23 Based on New Regulatory Order in the US | 11.4.0 |
| 03-2013 | RP-59 | RP-130272 | 1567 |  |  | Band 26: modification of A-MPR for 'NS\_15' | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1571r1 |  |  | Band 41 requirements for operation in China and Japan | 11.4.0 |
| 03-2013 | RP-59 | RP-130260 | 1574 |  |  | Remove [ ] from CSI test case parameters | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1575 |  |  | Corrections to UE co-existence | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1579 |  |  | UE-UE co-existence between Band 1 and Band 33/39 | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1580 |  |  | Correction on reference to note for Band 7 and 38 co-existence | 11.4.0 |
| 03-2013 | RP-59 | RP-130263 | 1584r1 |  |  | Cleanup for CA UE RF requirements | 11.4.0 |
| 03-2013 | RP-59 | RP-130263 | 1586 |  |  | Corrections on UL configuration for CA UE receiver requirements | 11.4.0 |
| 03-2013 | RP-59 | RP-130263 | 1588 |  |  | Correction of Transmit modulation quality requirements for CA | 11.4.0 |
| 03-2013 | RP-59 | RP-130268 | 1590 |  |  | Revision of Common Test Parameters for User-specific Demodulation Tests | 11.4.0 |
| 03-2013 | RP-59 | RP-130278 | 1595 |  |  | Correction for a Band 27 A-MPR table | 11.4.0 |
| 03-2013 | RP-59 | RP-130264 | 1597 |  |  | Correction of CA CQI test setup | 11.4.0 |
| 03-2013 | RP-59 | RP-130287 | 1600r1 |  |  | Correction of B12 DL Specification in Table 5.5A-2 | 11.4.0 |
| 03-2013 | RP-59 | RP-130263 | 1602 |  |  | Correction of table reference | 11.4.0 |
| 06-2013 | RP-60 | RP-130765 | 1604r1 |  |  | Complementary description for definition of MIMO Correlation Matrices using cross polarized antennas | 11.5.0 |
| 06-2013 | RP-60 | RP-130763 | 1607 |  |  | Correction of transport format parameters for CQI index 10 (15 RBs) - Rel 11 | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1610 |  |  | Maintenance of Band 23 A-MPR (NS\_11) in TS 36.101 (Rel-11) | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1613 |  |  | CR for 36.101 : Adding the definition of CA\_NS\_05 and CA\_NS\_06 for additional spurious emissions for CA | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1619 |  |  | CR for introducing UE TM3 demodulation performance requirements under high speed | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1623 |  |  | Correction of test parameters for eICIC performance requirements | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1625 |  |  | Correction of test parameters for eICIC CSI requirements | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1627 |  |  | Correction of resource allocation for the multiple PMI Cat 1 UE test | 11.5.0 |
| 06-2013 | RP-60 | RP-130766 | 1629 |  |  | Removal of note 2 from band 28 | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1641 |  |  | Correction of the CSI-RS parameter configuration | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1650r1 |  |  | Addition of Band 41 for intra-band non-contiguous CA for 36.101 | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1654r1 |  |  | MPR for intra-band non-contiguous CA | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1656 |  |  | Modification of configured output power to account for larger tolerance | 11.5.0 |
| 06-2013 | RP-60 | RP-130769 | 1658r1 |  |  | Missing symbols in the NS\_15 table | 11.5.0 |
| 06-2013 | RP-60 | RP-130766 | 1673 |  |  | Corrections to Rx requirements for inter-band CA configurations with REFSENS exceptions | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1681r1 |  |  | Correction for TS 36.101 | 11.5.0 |
| 06-2013 | RP-60 | RP-130763 | 1684 |  |  | RF: Corrections to RMC-s for sustained data rate test | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1685 |  |  | Non-contiguous intraband CA channel spacing | 11.5.0 |
| 06-2013 | RP-60 | RP-130766 | 1689 |  |  | Carrier aggregation in multi RAT and multiple band combination terminals | 11.5.0 |
| 06-2013 | RP-60 | RP-130766 | 1691 |  |  | Completion of out-of-band blocking requirements for inter-band CA with one UL | 11.5.0 |
| 06-2013 | RP-60 | RP-130767 | 1695r1 |  |  | CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1697 |  |  | Correction on UE maximum output power for intra-band CA (R11) | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1698r1 |  |  | CR for introduction of FeICIC demodulation performance requirements | 11.5.0 |
| 06-2013 | RP-60 | RP-130770 | 1701 |  |  | Removing bracket from CA\_11A-18A requirments | 11.5.0 |
| 06-2013 | RP-60 | RP-130767 | 1703 |  |  | CR on the bandwidth coverage issue of CA CQI performance (Rel-11) | 11.5.0 |
| 06-2013 | RP-60 | RP-130766 | 1705 |  |  | Corrections to ACLR for Rel-11 CA | 11.5.0 |
| 06-2013 | RP-60 | RP-130765 | 1716 |  |  | Corrections to NS\_11 A-MPR Table | 11.5.0 |
| 06-2013 | RP-60 | RP-130769 | 1717 |  |  | Corrections to NS\_12 A-MPR Table | 11.5.0 |
| 06-2013 | RP-60 | RP-130771 | 1532r1 |  |  | Introduction of CA 1+8 into TS36.101(Rel-12) | 12.0.0 |
| 06-2013 | RP-60 | RP-130781 | 1545r1 |  |  | Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 | 12.0.0 |
| 06-2013 | RP-60 | RP-130785 | 1608r1 |  |  | Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 | 12.0.0 |
| 06-2013 | RP-60 | RP-130777 | 1642r1 |  |  | Introduction of CA B3+19 into TS36.101(Rel-12) | 12.0.0 |
| 06-2013 | RP-60 | RP-130787 | 1687 |  |  | Introduction of CA\_4A-4A into 36.101 | 12.0.0 |
| 06-2013 | RP-60 | RP-130795 | 1712 |  |  | Adding 5MHz CBW for B3 of Inter band CA of B3+26 | 12.0.0 |
| 06-2013 | RP-60 | RP-130775 | 1713r1 |  |  | Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 | 12.0.0 |
| 06-2013 | RP-60 | RP-130790 | 1723r1 |  |  | Introduction of the LTE 450 band to TS 36.101 | 12.0.0 |
| 06-2013 | RP-60 | RP-130791 | 1724r1 |  |  | Introduction of the WCS band to TS 36.101 | 12.0.0 |
| 06-2013 | RP-60 | RP-130784 | 1707r1 |  |  | Introduction of CA 19+21 into TS36.101(Rel-12) | 12.0.0 |
| 09-2013 | RP-61 | RP-131300 | 1730r1 |  |  | 36.101 CR for LTE\_CA\_C\_B3 | 12.1.0 |
| 09-2013 | RP-61 | RP-131285 | 1732 |  |  | CR on performance requirements of CA soft buffer managemen (Rel-12) | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1733r1 |  |  | CR to introdue TM3 and TM4 test for 5MHz channel bandwidth | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1736 |  |  | CR on applicability of CA sustained data rate tests (Rel-12) | 12.1.0 |
| 09-2013 | RP-61 | RP-131293 | 1739 |  |  | Performance requirement for UE under EVA200 | 12.1.0 |
| 09-2013 | RP-61 | RP-131290 | 1743 |  |  | CR for introduction of FeICIC PBCH performance requirement | 12.1.0 |
| 09-2013 | RP-61 | RP-131290 | 1745 |  |  | CR for introduction of FeICIC RI reporting requirements | 12.1.0 |
| 09-2013 | RP-61 | RP-131292 | 1747 |  |  | Beamforming model for EPDCCH test | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1748 |  |  | CR to introduce CSI tests for LTE450 | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1749 |  |  | CR to extend UE category of the existing 5MHz performance requirements | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1767 |  |  | UE REFSENS when supporting intra-band CA and inter-band CA | 12.1.0 |
| 09-2013 | RP-61 | RP-131279 | 1772 |  |  | Correlation matrix for high speed train demodulation scenarios (Rel-12) | 12.1.0 |
| 09-2013 | RP-61 | RP-131280 | 1776 |  |  | Corrections to sustained data rate test (Rel-12) | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1781 |  |  | CR to introduce a new PHICH test based on 5MHz | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1782 |  |  | CR placeholder for applicability of new 5MHz tests | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1783r1 |  |  | CR : Proposal of applicability of new 5MHz tests | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1784 |  |  | CR: PHICH tests for 5MHz | 12.1.0 |
| 09-2013 | RP-61 | RP-131290 | 1786 |  |  | CR for introduction of FeICIC CQI requirements | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1794 |  |  | Clarification of multi-cluster transmission | 12.1.0 |
| 09-2013 | RP-61 | RP-131294 | 1800r1 |  |  | CA UE Coexistence Table update (Release 12) | 12.1.0 |
| 09-2013 | RP-61 | RP-131302 | 1802 |  |  | Coexistence between Band 27 and Band 38 (Release 12) | 12.1.0 |
| 09-2013 | RP-61 | RP-131285 | 1803 |  |  | Addional requirement for CA\_1A-18A into TS36.101 | 12.1.0 |
| 09-2013 | RP-61 | RP-131296 | 1804 |  |  | Add requirements for CA\_1A-26A into TS36.101 | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1807 |  |  | Incorrect REFSENS UL allocation for CA\_1C | 12.1.0 |
| 09-2013 | RP-61 | RP-131297 | 1808r1 |  |  | Introduction of CA\_2A-4A into 36.101 | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1811 |  |  | Contiguous intraband CA REFSENS with one UL | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1822 |  |  | The Pcmax clauses restructured: This CR was NOT implemented as it was based on the wrong version of the spec | 12.1.0 |
| 09-2013 | RP-61 | RP-131298 | 1824 |  |  | Introduction of inter-band CA Band 2+5 | 12.1.0 |
| 09-2013 | RP-61 | RP-131285 | 1831 |  |  | MPR for intra-band non-contiguous CA | 12.1.0 |
| 09-2013 | RP-61 | RP-131281 | 1832 |  |  | Correction to Rel-10 A-MPR for CA\_NS\_04 | 12.1.0 |
| 09-2013 | RP-61 | RP-131285 | 1834 |  |  | CR for 36.101 : Add the definition of 5+20MHz for spectrum emission mask for CA | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1839 |  |  | CR to introduce CSI tests for LTE450 | 12.1.0 |
| 09-2013 | RP-61 | RP-131293 | 1840 |  |  | Remianed Transmitter requirements for intra-band non-contiguous CA | 12.1.0 |
| 09-2013 | RP-61 | RP-131303 | 1841 |  |  | CR to introdue TM3 and TM4 test for 5MHz channel bandwidth | 12.1.0 |
| 12-2013 | RP-62 | RP-131928 | 1847r1 |  |  | Corrections to the notes in the band UE co-existence requirements table (Rel-12) | 12.2.0 |
| 12-2013 | RP-62 | RP-131924 | 1852 |  |  | Clean-up of uplink reference measurement channels (Rel-12) | 12.2.0 |
| 12-2013 | RP-62 | RP-131946 | 1857 |  |  | Introduction of CA band combination Band2 + Band12 to TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131954 | 1858 |  |  | Introduction of CA band combination Band12 + Band25 to TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131931 | 1867 |  |  | CA\_NS\_05 Emissions | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 1869 |  |  | NS signaling for CA refsens | 12.2.0 |
| 12-2013 | RP-62 | RP-131965 | 1870 |  |  | Introduction of CA\_23A-23A RF requirements into 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131928 | 1877r2 |  |  | Intraband CA channel bandwidth combination table restructuring | 12.2.0 |
| 12-2013 | RP-62 | RP-131940 | 1878 |  |  | Addition of CA\_3C missing UE to UE co-existence requirement and corection to SEM | 12.2.0 |
| 12-2013 | RP-62 | RP-131959 | 1885 |  |  | Introduction of LTE\_CA\_C\_B27 to 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 1887 |  |  | CR on correction of definition on Fraction of Maximum Throughput for CA | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 1889 |  |  | CR on correction of test configurations of CA soft buffer tests | 12.2.0 |
| 12-2013 | RP-62 | RP-131936 | 1893 |  |  | CR for FeICIC demodulation performance requirements | 12.2.0 |
| 12-2013 | RP-62 | RP-131936 | 1895r1 |  |  | CR on FeICIC PBCH performance requirement | 12.2.0 |
| 12-2013 | RP-62 | RP-131936 | 1897r1 |  |  | CR on RI reporting requirement | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 1899 |  |  | Beamforming model for EPDCCH localized test | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 1901 |  |  | Downlink physical setup for EPDCCH test | 12.2.0 |
| 12-2013 | RP-62 | RP-131926 | 1904 |  |  | Correction on the UE category for eICIC CQI test | 12.2.0 |
| 12-2013 | RP-62 | RP-131931 | 1906 |  |  | CR for receiver type verification test of CSI-RS based advanced receivers (Rel-12) | 12.2.0 |
| 12-2013 | RP-62 | RP-131956 | 1910r1 |  |  | Spurious emission band UE co-existence requirements for cross-region issue | 12.2.0 |
| 12-2013 | RP-62 | RP-131928 | 1916r2 |  |  | Allowed power reductions for multiple transmissions in a subframe | 12.2.0 |
| 12-2013 | RP-62 | RP-131967 | 1917r1 |  |  | The coexistence requirements between Band 39 and Band 3 | 12.2.0 |
| 12-2013 | RP-62 | RP-131967 | 1918r1 |  |  | The Pcmax clauses restructured and removal of addition of ΔTc to P-MPR | 12.2.0 |
| 12-2013 | RP-62 | RP-131956 | 1919 |  |  | Configured maximum output power for multiple TAG transmission | 12.2.0 |
| 12-2013 | RP-62 | RP-131936 | 1927r1 |  |  | Configured maximum output power for multiple TAG transmission | 12.2.0 |
| 12-2013 | RP-62 | RP-131927 | 1934 |  |  | CR on correction of FRC of power imbalance test | 12.2.0 |
| 12-2013 | RP-62 | RP-131927 | 1937 |  |  | UE-UE coexistence for Band 40 | 12.2.0 |
| 12-2013 | RP-62 | RP-131957 | 1955r1 |  |  | Introduction of LTE Advanced intra-band contiguous Carrier Aggregation in Band 23 to TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131961 | 1956r1 |  |  | Introduction of CA\_3A-3A into TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 1957 |  |  | CR Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource) | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 1958 |  |  | CR Minimum requirement with Same Cell ID (with multiple NZP CSI-RS resources) | 12.2.0 |
| 12-2013 | RP-62 | RP-131936 | 1962 |  |  | Introduction of reference SNR-s for FeICIC demodulation performance requirements | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 1964 |  |  | OCNG pattern for EPDCCH test | 12.2.0 |
| 12-2013 | RP-62 | RP-131931 | 1965 |  |  | CA performance requirements for TDD intra-band NC CA | 12.2.0 |
| 12-2013 | RP-62 | RP-131958 | 1966r1 |  |  | CA performance requirements for TDD intra-band NC CA | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 1968 |  |  | Introduction of UE TM3 demodulation performance requirements under ETU300 | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 1970 |  |  | Introduction of test 1-A for CoMP | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 1972 |  |  | Modification of TM9 test to verify correct SNR estimation | 12.2.0 |
| 12-2013 | RP-62 | RP-131928 | 1984 |  |  | Correction to blocking requirements and use of Delta\_RIB | 12.2.0 |
| 12-2013 | RP-62 | RP-131950 | 1985 |  |  | Introduction of CA band combination Band5 + Band25 to TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 1988r1 |  |  | CR on test point clarification for CA demodulation test | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 1994 |  |  | CR to Introduce fading CQI test for CoMP (TDD) | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 1996 |  |  | CR to Introduce channel model for CoMP fading CQI tests | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 1998 |  |  | CR to Introduce RI test for CoMP (FDD) | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 2001r1 |  |  | Distributed EPDCCH Demodulation Test | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 2003r1 |  |  | Localized EPDCCH Demodulation Test | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 2005r1 |  |  | Localized EPDCCH Demodulation Test | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2007 |  |  | Introduction of DL CoMP FDD static CQI test | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2009 |  |  | Introduction of DL CoMP TDD static CQI test | 12.2.0 |
| 12-2013 | RP-62 | RP-131924 | 2014 |  |  | P-max for Band 38 to Band 7 coexistence | 12.2.0 |
| 12-2013 | RP-62 | RP-131948 | 2015 |  |  | Introduction of CA band combination B5 + B7 to TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131952 | 2017 |  |  | Introduction of CA band combination B7 + B28 to TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2024 |  |  | Minimum requirement with Same Cell ID (with multiple NZP CSI-RS resources) TDD | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2026 |  |  | CR Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource) TDD | 12.2.0 |
| 12-2013 | RP-62 | RP-131936 | 2028 |  |  | Editoral change on FeICIC PBCH Noc setup | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2032 |  |  | Introduction of test 1-A for CoMP | 12.2.0 |
| 12-2013 | RP-62 | RP-131931 | 2035r1 |  |  | Correction of nominal guard bands for bandwidth classes A, B and C | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2042 |  |  | CR to Introduce RI test for CoMP (TDD) | 12.2.0 |
| 12-2013 | RP-62 | RP-131937 | 2043 |  |  | CR to Introduce fading CQI test for CoMP (FDD) | 12.2.0 |
| 12-2013 | RP-62 | RP-131931 | 2045 |  |  | Correction of TDD PCFICH/PDCCH test parameter table | 12.2.0 |
| 12-2013 | RP-62 | RP-131939 | 2047 |  |  | Add EVA200 to table of channel model parameters | 12.2.0 |
| 12-2013 | RP-62 | RP-131963 | 2050r1 |  |  | Introduction of CA\_7A-7A into TS 36.101 | 12.2.0 |
| 12-2013 | RP-62 | RP-131967 | 2057 |  |  | Band 41 deployment in Japan | 12.2.0 |
| 12-2013 | RP-62 | RP-131926 | 2059 |  |  | CA\_1C: Correction on CA\_NS\_02 A-MPR table | 12.2.0 |
| 12-2013 | RP-62 | RP-131924 | 2060 |  |  | Simplification of Band 12/17 in-band blocking test cases | 12.2.0 |
| 12-2013 | RP-62 | RP-131967 | 2064 |  |  | Correction of duplicated notes on table 7.3.1A-3 | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 2066 |  |  | Introduction of EPDCCH TM10 localized test R-12 | 12.2.0 |
| 12-2013 | RP-62 | RP-131938 | 2068 |  |  | Introduction of SDR test for PDSCH with EPDCCH scheduling | 12.2.0 |
| 03-2014 | RP-63 | RP-140377 | 2115 |  |  | Editorial Correction for TS36.101 Rel-12 | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2108 |  |  | UL-DL configuration and other parameters for FeICIC TDD CQI fading test (Rel-12) | 12.3.0 |
| 03-2014 | RP-63 | RP-140374 | 2097 |  |  | CR on TM9 localized ePDCCH test | 12.3.0 |
| 03-2014 | RP-63 | RP-140374 | 2101 |  |  | CR on reference measurement channel for ePDCCH test | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2110 |  |  | CR for TS36.101 COMP demodulation requirements | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2113 |  |  | CR for Combinations of channel model parameters | 12.3.0 |
| 03-2014 | RP-63 | RP-140374 | 2114 |  |  | CR for EPDCCH power allocation (Rel-12) | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2106 |  |  | Cleanup of the specification for FeICIC (Rel-12) | 12.3.0 |
| 03-2014 | RP-63 | RP-140375 | 2089 |  |  | CR for introduction of 15MHz based single carrier and CA SDR tests in Rel-12 | 12.3.0 |
| 03-2014 | RP-63 | RP-140375 | 2080r1 |  |  | CR on TM3 demodulation and soft buffer management test | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2086 |  |  | CR on reference measurement channel for TM10 PDSCH demodulation test | 12.3.0 |
| 03-2014 | RP-63 | RP-140241 | 2174 |  |  | Introduction of 3MHz in Band 8 for CA\_8\_20 RF requirements into TS36.101 | 12.3.0 |
| 03-2014 | RP-63 | RP-140417 | 2173r1 |  |  | Addition of bandwidth combination set for CA\_2A-29A and CA\_4A-29A | 12.3.0 |
| 03-2014 | RP-63 | RP-140387 | 2071r1 |  |  | Introduction of TDD inter-band CA\_B39\_B41 into 36.101 | 12.3.0 |
| 03-2014 | RP-63 | RP-140378 | 2069 |  |  | CA\_3C is adding 100RB+75RB uplink configuration for reference sensitivity | 12.3.0 |
| 03-2014 | RP-63 | RP-140388 | 2070 |  |  | CR for TS36.101 on CA\_C\_B39 | 12.3.0 |
| 03-2014 | RP-63 | RP-140386 | 2072 |  |  | Introduction of CA band B3+B27 to TS36.101 | 12.3.0 |
| 03-2014 | RP-63 | RP-140374 | 2074 |  |  | CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12) | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2142 |  |  | Clarification of contiguous and non-contiguous intra-band UE capabilities in the same band | 12.3.0 |
| 03-2014 | RP-63 | RP-140385 | 2161 |  |  | Inrtroduction of additional bandwidth combination set for CA\_2A-4A | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2131r1 |  |  | CR to finalize RI test for CoMP | 12.3.0 |
| 03-2014 | RP-63 | RP-140368 | 2147 |  |  | Correction of coding rate for 18RBs in UL RMC table | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2144 |  |  | Channel spacing for non-contiguous intra-band carrier aggregation | 12.3.0 |
| 03-2014 | RP-63 | RP-140374 | 2163 |  |  | Distributed EPDCCH Demodulation Test | 12.3.0 |
| 03-2014 | RP-63 | RP-140368 | 2137 |  |  | Configured transmitted power for CA | 12.3.0 |
| 03-2014 | RP-63 | RP-140368 | 2122 |  |  | CR for 36.101. Editorial correction on OCNG pattern | 12.3.0 |
| 03-2014 | RP-63 | RP-140370 | 2160 |  |  | Correction of table notes for NS\_12-NS\_15 spurious emissions requirements | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2129r1 |  |  | CR to finalize fading CQI test for CoMP | 12.3.0 |
| 03-2014 | RP-63 | RP-140375 | 2119 |  |  | Introduction of requirements for SNR test for TM9 | 12.3.0 |
| 03-2014 | RP-63 | RP-140374 | 2125 |  |  | CR on correction of downlink SDR tests with EPDCCH scheduling | 12.3.0 |
| 03-2014 | RP-63 | RP-140371 | 2127 |  |  | Correction on DL CoMP static CQI tests (Rel 12) | 12.3.0 |
| 06-2014 | RP-64 | RP-140909 | 2177r3 |  |  | RF: Corrections to spurious emission requirements with NS different than NS\_01 (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140932 | 2187r1 |  |  | Additional bandwidth combination set for LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 20 | 12.4.0 |
| 06-2014 | RP-64 | RP-140934 | 2188 |  |  | Additional bandwidth combination set for LTE Advanced inter-band Carrier Aggregation of Band 7 and Band 20 | 12.4.0 |
| 06-2014 | RP-64 | RP-140943 | 2195r1 |  |  | CR for TS 36.101 on introduction CA\_41D | 12.4.0 |
| 06-2014 | RP-64 | RP-140943 | 2196r3 |  |  | CR to TS 36.101 on introduction of CA BW class D requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2198 |  |  | CR on correction on TDD IRC CQI test | 12.4.0 |
| 06-2014 | RP-64 | RP-140917 | 2207 |  |  | CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2209 |  |  | Clean up of TM9 SNR tests | 12.4.0 |
| 06-2014 | RP-64 | RP-140933 | 2210r1 |  |  | Introduction of band B4+B27 CA to TS36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140942 | 2213 |  |  | Introduction of CA band combination B1+B20 to TS 36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140917 | 2216 |  |  | CR for EPDCCH test (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2218 |  |  | CR of modification on FeICIC rank testing (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2220 |  |  | CR on FeICIC PBCH performance requirement (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2222 |  |  | Correction on out-of-band blocking for CA | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2226 |  |  | Update demodualtion performance requirements with new UE categories | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2228 |  |  | Correction for CA sustained data rate test (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140945 | 2229 |  |  | Correction on wrong annotation for close- loop spatial multiplexing performance | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2233 |  |  | Clarification of Intra-band contiguous CA class C Narrow band blocking requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2239 |  |  | Correction for CA soft buffer test (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2241 |  |  | CR on OCNG and propagation conditions for dual layer TM9 test (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2247 |  |  | Remove [ ] from eICIC TDD RI requirement | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2256 |  |  | Verification of exceptions of REFSENS requirements for carrier aggregation | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2258 |  |  | Applicability of exceptions to reference sensitivity requirements for CA | 12.4.0 |
| 06-2014 | RP-64 | RP-140909 | 2269 |  |  | In-band blocking case numbering re-establisment | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2273 |  |  | CR for TS36.101 FRC tables for COMP demodulation requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140945 | 2277 |  |  | Editorial correction of note in clause 4.4 | 12.4.0 |
| 06-2014 | RP-64 | RP-140926 | 2282r1 |  |  | Editorial correction of note in clause 4.4 | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2283 |  |  | Introduction of new bandwidth combination set for CA\_1A-5A UE | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2286 |  |  | CR for finalizing DL COMP CSI reporting requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2288 |  |  | CR for adding DL CoMP CSI RMC tables (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140921 | 2291 |  |  | Simplification of 36.101 Table 5.6A.1-1 for LTE\_CA\_C\_B27 | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2293 |  |  | Finalization of CoMP demodulation test cases | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2294 |  |  | Editorial corrections for UE performance requirements for R12 | 12.4.0 |
| 06-2014 | RP-64 | RP-140937 | 2295 |  |  | Introduction of CA performance requirements for Band 27 CA | 12.4.0 |
| 06-2014 | RP-64 | RP-140931 | 2296 |  |  | Introduction of CA 1+11 to 36.101 (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140994 | 2309 |  |  | Inclusion of the out of band emission limit concluded in CEPT into band 28 | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2314 |  |  | UE to UE co-existence between B42/B43 | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2318 |  |  | Perf: Corrections to CA (Class C) performance with power imbalance (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140920 | 2319 |  |  | Introduction of CA performance requirements for Band 23 CA | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2321 |  |  | CR of modification on FeICIC rank testing (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2323 |  |  | CR of introducing FeICIC TM9 testing (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140917 | 2325 |  |  | CR for EPDCCH SDR test (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2328 |  |  | Clean-up CR for demodulation requirements (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140945 | 2330r1 |  |  | Additional updates of UE categories for demodualtion performance requirements (Rel-12) | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2333 |  |  | Throughput calculation for eICIC demodulation requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2335r1 |  |  | Introduction of Band 28 requirements for flexible operation in Japan | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2337r1 |  |  | Add missing Uplink downlink configuration to eICIC TDD RI requirement | 12.4.0 |
| 06-2014 | RP-64 | RP-140945 | 2338 |  |  | Add static propagation condition matrix for 1 x 2 | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2341 |  |  | Cleanup of terminology for Rx requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140945 | 2344 |  |  | CR on separating CA UE demodulation tests from single carrier tests in Rel-12 | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2351 |  |  | Test configuration for intra-band contiguous carrier aggregation power control | 12.4.0 |
| 06-2014 | RP-64 | RP-140935 | 2358 |  |  | Addition of bandwidth combination sets for CA\_2A-29A, CA\_3A-5A, CA\_4A-5A, CA\_4A-12A, and CA\_4A-29A into 36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2362 |  |  | Correction of test configurations for intra-band non-contiguous aggregation | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2365 |  |  | Clarification on CA bandwidth classes | 12.4.0 |
| 06-2014 | RP-64 | RP-140917 | 2374 |  |  | CR on correction of downlink SDR tests with EPDCCH scheduling | 12.4.0 |
| 06-2014 | RP-64 | RP-140922 | 2377 |  |  | Correction on LTE\_CA\_C\_B39 | 12.4.0 |
| 06-2014 | RP-64 | RP-140911 | 2378 |  |  | Corrections on CA CQI tests | 12.4.0 |
| 06-2014 | RP-64 | RP-140930 | 2381r1 |  |  | Introduction of LTE-Advanced CA of Band 8 and Band 40 to TS36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140927 | 2382r1 |  |  | FRC for DL MIMO enahncement PMI requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140603 | 2384r2 |  |  | CR for TS 36.101 on introduction CA\_40D | 12.4.0 |
| 06-2014 | RP-64 | RP-140944 | 2385r1 |  |  | CR to TS 36.101 on introduction of 3DL intra-band non-contiguous CA requirements | 12.4.0 |
| 06-2014 | RP-64 | RP-140938 | 2387 |  |  | Introduction of CA\_2A-2A into TS 36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140927 | 2392 |  |  | Introduction of 4Tx beam steering model | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2394 |  |  | CA\_7C A-MPR Corrections | 12.4.0 |
| 06-2014 | RP-64 | RP-140936 | 2395r2 |  |  | Introduction of a new CA\_7C bandwidth combination set into 36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140918 | 2398 |  |  | CR for TS36.101 CSI RMC table | 12.4.0 |
| 06-2014 | RP-64 | RP-140940 | 2413 |  |  | Introduction of LTE\_CA\_NC\_B42 into 36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140942 | 2420 |  |  | Introduction of CA band combination B1+B20 to TS 36.101 | 12.4.0 |
| 06-2014 | RP-64 | RP-140919 | 2422 |  |  | CA\_3C is deleting 75RB+75RB uplink configuration for reference sensitivity | 12.4.0 |
| 06-2014 | RP-64 | RP-140914 | 2425 |  |  | CR on correction for TM10 CSI reporting requirements | 12.4.0 |
| 09-2014 | RP-65 | RP-141197 | 2458r1 |  |  | Introduction of CA\_B1\_B3\_B19 into TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141428 | 2568 |  |  | Updated REFSENS requirements for band combinations with Band 4 and Band 12 | 12.5.0 |
| 09-2014 | RP-65 | RP-141468 | 2508r1 |  |  | Introduction of 3 DL CA for Band 1+3+20 | 12.5.0 |
| 09-2014 | RP-65 | RP-141469 | 2571 |  |  | Correction to CA in Band 1+20 | 12.5.0 |
| 09-2014 | RP-65 | RP-141525 | 2504r1 |  |  | Perf: Cleanup and better description of DL-RMC-s with dynamic coding rate for CSI requirements (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141525 | 2565 |  |  | Corrections to UE coex table | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2434 |  |  | Correction on support of a bandwidth combination set | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2452r1 |  |  | Remove the redundant table for FDD 4Tx multi-layer tests and correct the test case number (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2466 |  |  | Unequal DL CC RB allocations in Maximum input level | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2469 |  |  | Intra-band contiguous CA ACS case 2 test clarification | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2484 |  |  | Corrections on delta Tc for UE MOP for intra-band contiguous CA | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2487 |  |  | Removal of Class B in UE TX requirement | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2516r1 |  |  | CR for CA applicability rule in 36.101 in Rel-12 | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2519r1 |  |  | Editorial CR for CA performance tests in 36.101 in Rel-12 | 12.5.0 |
| 09-2014 | RP-65 | RP-141527 | 2548 |  |  | Correction to NS\_20 A-MPR for Band 23 | 12.5.0 |
| 09-2014 | RP-65 | RP-141530 | 2447 |  |  | CR of introducing FeICIC TM9 testing (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141530 | 2454 |  |  | Maintenance of CoMP demodulation performance requirements (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141530 | 2456 |  |  | Clean-up CR for EPDCCH and FeICIC PBCH (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141530 | 2471 |  |  | Throughput calculation for feICIC demodulation requirements | 12.5.0 |
| 09-2014 | RP-65 | RP-141532 | 2439 |  |  | CR on correction on CQI reporting TDD CSI meas in case two CSI subframe sets with CRS test (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141532 | 2441 |  |  | CR on correction on RI reporting CSI meas in case two CSI subframe sets with CRS tests (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141532 | 2444 |  |  | Clarification of high speed train scenario in 36.101 (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141532 | 2478 |  |  | CQI reporting under fading: CQI indices in set | 12.5.0 |
| 09-2014 | RP-65 | RP-141532 | 2490 |  |  | Correction on A-MPR table | 12.5.0 |
| 09-2014 | RP-65 | RP-141532 | 2499 |  |  | RF: Corrections to spurious emission band co-existence requirement for Band 44 | 12.5.0 |
| 09-2014 | RP-65 | RP-141535 | 2559 |  |  | Addition of E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA for Band 4 and 27 | 12.5.0 |
| 09-2014 | RP-65 | RP-141537 | 2541 |  |  | Band 42 contiguous CA channel bandwidth correction | 12.5.0 |
| 09-2014 | RP-65 | RP-141546 | 2463r1 |  |  | Introduction of PMI reporting requirements for DL MIMO enhancement | 12.5.0 |
| 09-2014 | RP-65 | RP-141548 | 2457r2 |  |  | Introduction of CA\_B1\_B3 into TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141549 | 2556 |  |  | Addition of bandwidth combination set for CA\_2A-4A | 12.5.0 |
| 09-2014 | RP-65 | RP-141550 | 2566 |  |  | Addition of 3MHz bandwidth for Band 12 , in the B2+B12 CA combination | 12.5.0 |
| 09-2014 | RP-65 | RP-141551 | 2445 |  |  | Introduction of CA 8+11 to 36.101 (Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141553 | 2491r1 |  |  | Introduction of a new bandwidth combination set for CA\_25A-25A into 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141554 | 2533r1 |  |  | Introduction of requirements for 3DL inter-band carrier aggregation (FDD) | 12.5.0 |
| 09-2014 | RP-65 | RP-141554 | 2534 |  |  | Introduction of requirements for 3DL combinations with Band 30 (FDD) | 12.5.0 |
| 09-2014 | RP-65 | RP-141557 | 2461r1 |  |  | Introduction of CA\_B19\_B42\_B42 into TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141559 | 2460r1 |  |  | Introduction of CA\_B1\_B42\_B42 into TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141560 | 2427 |  |  | Adding 15MHz channel BW to B40 3DL and new bandwidth combination set for the 2DL | 12.5.0 |
| 09-2014 | RP-65 | RP-141561 | 2488r1 |  |  | Corrections on Maximum input level for intra-band non-contiguous 3DL | 12.5.0 |
| 09-2014 | RP-65 | RP-141562 | 2436 |  |  | Corrections on Maximum input level and ACS for intra-band CA | 12.5.0 |
| 09-2014 | RP-65 | RP-141562 | 2481r1 |  |  | Introduction of CA band combination B41+ B42 to TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141562 | 2522 |  |  | CR on CA power imbalance tests in Rel-12 | 12.5.0 |
| 09-2014 | RP-65 | RP-141562 | 2560 |  |  | CR Reducing MPR for Contiguous CA with Non-Contiguous Resource Allocations | 12.5.0 |
| 09-2014 | RP-65 | RP-141563 | 2555r1 |  |  | UL configuration for CA\_4A-12A reference sensitivity | 12.5.0 |
| 09-2014 | RP-65 | RP-141563 | 2557 |  |  | Addition of bandwidth combination set for CA\_4A-12A | 12.5.0 |
| 09-2014 | RP-65 | RP-141612 | 2494r2 |  |  | Introduction of inter-band CA\_18-28 into TS36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141635 | 2552r2 |  |  | Introduction of CA\_1A-7A into 36.101(Rel-12) | 12.5.0 |
| 09-2014 | RP-65 | RP-141636 | 2480r2 |  |  | Introduction of 3DLs CA band combination of Band1 +5 + 7 to TS 36.101 Rel-12 | 12.5.0 |
| 09-2014 | RP-65 | RP-141653 | 2435r3 |  |  | Introduction of 3 Band Carrier Aggregation (3DL/1UL) of Band 1, Band 3 and Band 8 to TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141682 | 2570r1 |  |  | Introduction of CA band combination B1+B7+B20 to TS 36.101 | 12.5.0 |
| 09-2014 | RP-65 | RP-141708 | 2492r3 |  |  | Introduction of 3 Band Carrier Aggregation of Band 1,Band 3 and Band 5 to TS 36.101 | 12.5.0 |
| 12-2014 | RP-66 | RP-142147 | 2671 |  |  | Correction of CoMP TDD CSI tests (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2574 |  |  | CR for REFSENSE in lower SNR and change history | 12.6.0 |
| 12-2014 | RP-66 | RP-142173 | 2581 |  |  | CR on 4Tx codebook PMI testing | 12.6.0 |
| 12-2014 | RP-66 | RP-142142 | 2587 |  |  | CR for 1 PRB allocation performance in presence of MBSFN (rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2590 |  |  | Maintenance of CA demodulation performance requirements (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2592 |  |  | Clean up for FeICIC demodulation performance requirements (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142166 | 2600 |  |  | Correction of placement of CA\_40D in Table | 12.6.0 |
| 12-2014 | RP-66 | RP-142162 | 2601 |  |  | CQI test for TDD CL\_C 20MHz+15MHz in Rel-12 | 12.6.0 |
| 12-2014 | RP-66 | RP-142162 | 2602 |  |  | Sustained downlink data rate test for TDD CL\_C 20MHz+15MHz in Rel-12 | 12.6.0 |
| 12-2014 | RP-66 | RP-142165 | 2611 |  |  | Removal of square brackets for CA\_B1\_B3 and CA\_B1\_B3\_B19 | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2620 |  |  | CQI reporting in AWGN: CQI indices in set | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2629 |  |  | CR to fix error of CA capability for CA performance tests in 36.101 in Rel-12 | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2637 |  |  | Definition of the bits in the bitmap for indication of modified MPR behavior | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2641 |  |  | Applicability of in-gap and out-of-gap measurements for intra-band NC CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142183 | 2642 |  |  | Introduction of additional bandwidth combination set for CA\_2A-5A | 12.6.0 |
| 12-2014 | RP-66 | RP-142164 | 2643 |  |  | Corrections for 3DL inter-band CA band combinations | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2661 |  |  | Maintenance of TM10 demodulation test configurations on PQI set and ZP-CSIRS ( Rel-12 test 8.3.1.3.2, 8.3.2.4.2 ) | 12.6.0 |
| 12-2014 | RP-66 | RP-142173 | 2582r1 |  |  | Introduction of PUSCH 3-2 requirements into TS36.101 | 12.6.0 |
| 12-2014 | RP-66 | RP-142162 | 2603r1 |  |  | Normal demodulation test for TDD CL\_C 20MHz+15MHz in Rel-12 | 12.6.0 |
| 12-2014 | RP-66 | RP-142164 | 2576r1 |  |  | Corrections on Out-of-band blocking requirements for CA Class B and D | 12.6.0 |
| 12-2014 | RP-66 | RP-142149 | 2678 |  |  | CR to specify applicability of CoMP RI test (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2688 |  |  | Removal of bracket for UL MIMO | 12.6.0 |
| 12-2014 | RP-66 | RP-142164 | 2689 |  |  | Corection of B29 REFSENS for CA\_2A-29A-30A and CA\_4A-29A-30A | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2700 |  |  | Delete the incorrect notes for FDD DMRS demodulation tests (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142160 | 2594r3 |  |  | Correcting requirements for inter-band CA\_18-28 in TS36.101 | 12.6.0 |
| 12-2014 | RP-66 | RP-142173 | 2705 |  |  | CR of modification on PMI reporting requirements for DL MIMO enhancement | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2720 |  |  | Band 22 correction in UE to UE co-existance table. | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2722 |  |  | Correction to non-contiguous downlink intraband CA receiver requirements | 12.6.0 |
| 12-2014 | RP-66 | RP-142159 | 2752 |  |  | Removal of dRib from CA\_1A-7A | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2723 |  |  | Correction to table format of allowed channel bandwidths of non-contiguous intraband CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142164 | 2643r1 |  |  | Corrections for 3DL inter-band CA band combinations | 12.6.0 |
| 12-2014 | RP-66 | RP-142146 | 2731 |  |  | Modifications for NS\_12 and NS\_13 | 12.6.0 |
| 12-2014 | RP-66 | RP-142189 | 2739 |  |  | Introduction of CA\_5-13 into 36.101 | 12.6.0 |
| 12-2014 | RP-66 | RP-142173 | 2706r1 |  |  | CR of reference measurement channel for PUSCH3-2 test | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2727r1 |  |  | CR for CA applicability rule in 36.101 in Rel-12 | 12.6.0 |
| 12-2014 | RP-66 | RP-142188 | 2676r1 |  |  | CR to remove CA capability column in CA performance test tables (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142173 | r3 |  |  | Introduction of PUSCH 3-2 requirements into TS36.101 | 12.6.0 |
| 12-2014 | RP-66 | RP-142187 | 2690r1 |  |  | CR on sustained data rate test for 3DL CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142187 | 2681r2 |  |  | CR on normal demodulation test for 3DL CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2747r1 |  |  | TS36.101 removal of brackets (RF) | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2755 |  |  | Correction to Transmit Modulation Quality for CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2710r1 |  |  | Clarification on UL and DL CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2717r1 |  |  | Clarification of notes relating to interferer offsets in intraband CA receiver requirement tables. | 12.6.0 |
| 12-2014 | RP-66 | RP-142147 | 2735r1 |  |  | Band 28 and NS\_24 | 12.6.0 |
| 12-2014 | RP-66 | RP-142179 | 2684r1 |  |  | CR for UE requirements for 256QAM | 12.6.0 |
| 12-2014 | RP-66 | RP-142180 | 2729r1 |  |  | Introduction of Dual Connectivity to TS 36.101 Rel-12, RF part | 12.6.0 |
| 12-2014 | RP-66 | RP-142184 | 2680r1 |  |  | Introduction of dual uplink inter-band CA in TS 36.101 rel-12 | 12.6.0 |
| 12-2014 | RP-66 | RP-142182 | 2701r1 |  |  | Introduction of inter-band CA\_1-28 into TS36.101 | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2758 |  |  | Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2751r2 |  |  | Removal of brackets and TBD from CA feature | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2697r1 |  |  | Maintenance of CA performance requirements (Rel-12) | 12.6.0 |
| 12-2014 | RP-66 | RP-142187 | 2679r2 |  |  | CR to introduce CQI test for 3 DL CA | 12.6.0 |
| 12-2014 | RP-66 | RP-142185 | 2721r1 |  |  | Addition of 2UL non-contiguous intraband CA feature | 12.6.0 |
| 12-2014 | RP-66 | RP-142144 | 2704r2 |  |  | UE to UE co-existence between B42/B43 | 12.6.0 |
| 12-2014 | RP-66 | RP-142176 | 2685r2 |  |  | Introduction of LC MTC into TS 36.101 | 12.6.0 |
| 12-2014 | RP-66 | RP-142190 | 2759r1 |  |  | Introduction of additional band combinations for 3DL inter-band CA | 12.6.0 |
| 03-2015 | RP-67 | RP-150387 | 2760r2 |  |  | Introduce additional bands of LC MTC | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2761 |  |  | CR on corrections to Dual-Layer Spatial Multiplexing with multiple CSI-RS config Rel-12 | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2765r1 |  |  | CR for applicability and test rules for TDD-FDD CA performance requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2766 |  |  | Introduction of CQI tests for TDD-FDD CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150395 | 2767r1 |  |  | CR to introduce the SU-MIMO whitening verification test | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2768r1 |  |  | CR on power imbalance test for 3DL CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2769 |  |  | CR on sustained data rate test for TDD FDD CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150394 | 2770r1 |  |  | CR for introduction of 256QAM demodulation performance requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150393 | 2772r1 |  |  | CR: DC UE performance requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150390 | 2773r1 |  |  | CR: MTC demodulation performance requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150390 | 2774r1 |  |  | CR: MTC CSI requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150396 | 2775r1 |  |  | Introduction of the eIMTA functional PDSCH demodulation test | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2776r3 |  |  | CR on RF core requirements for D2D | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2777 |  |  | Modification of CSI reference measurement channel Rel-12 | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2779 |  |  | Editorial correction for CA\_18A-28A | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2781 |  |  | Removing brackets for CA\_1A-28A MSD requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150384 | 2783 |  |  | Editorial correction on symbols for enhanced performance requirements type A | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2784 |  |  | Corrections on reference measurement channel | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2792 |  |  | Correction of TS 36.101 for the Pcell support of 25+41 | 12.7.0 |
| 03-2015 | RP-67 | RP-150395 | 2793r1 |  |  | CR for single cell demodulation test for SU-MIMO | 12.7.0 |
| 03-2015 | RP-67 | RP-150391 | 2794 |  |  | Introduction of CA\_3A-42A and CA\_3A-42C into 36.101 | 12.7.0 |
| 03-2015 | RP-67 | RP-150384 | 2797 |  |  | UL HARQ in PDSCH and PDCCH/PCFICH demod test cases for eICIC/feICIC with MBSFN ABS | 12.7.0 |
| 03-2015 | RP-67 | RP-150382 | 2800 |  |  | Correction to eICIC aggressor cell configurations | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2801 |  |  | R4-73AH-0040: Correction for uplik CA configuration in TS 36.101 Rel-12 | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2802r1 |  |  | Correction of MSD levels for CA\_1A-8A in TS 36.101 rel-12 | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2805 |  |  | Removal of eDL-MIMO term from specification | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2809 |  |  | Clarification of 2UL/3DL contiguous intraband CA REFSENS test | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2811r1 |  |  | CR on TM4 normal demodulation test for 3DL CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2812 |  |  | CR on introducing new DL referece measurement channels | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2813r1 |  |  | CR on normal demodulation test for TDD-FDD CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2815 |  |  | Additions of bandwidth combination set reference | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2816 |  |  | Correction of band number in Table 5.6A.1-2a for LTE\_CA\_B4\_B12\_B30 | 12.7.0 |
| 03-2015 | RP-67 | RP-150382 | 2819 |  |  | UE to UE co-existence between B42/B43 | 12.7.0 |
| 03-2015 | RP-67 | RP-150382 | 2822 |  |  | Corrections to CA in-band emissions requirement | 12.7.0 |
| 03-2015 | RP-67 | RP-150381 | 2830 |  |  | Uplink RMCs for sustained data rate test | 12.7.0 |
| 03-2015 | RP-67 | RP-150382 | 2833 |  |  | Corrections to the CA power imbalance test | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2839r1 |  |  | CR for soft buffer tests for TDD-FDD CA in 36.101 in Rel-12 | 12.7.0 |
| 03-2015 | RP-67 | RP-150392 | 2842 |  |  | Editorial CR for CA UE performance tests in 36.101 in Rel-12 | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2847 |  |  | UE spurious emissions structure correction for CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2850 |  |  | Correction of PCMAX for uplink inter-band and intra-band carrier aggregation | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2851 |  |  | Exceptions for spurious response for UL CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150388 | 2852r1 |  |  | Correction of REFSENS, OOBB and uplink configuration for 3DL/1UL CA | 12.7.0 |
| 03-2015 | RP-67 | RP-150390 | 2853 |  |  | SNR definition for category 0 UE | 12.7.0 |
| 03-2015 | RP-67 | RP-150390 | 2854r1 |  |  | FRC for category 0 UE PDSCH performance requirements | 12.7.0 |
| 03-2015 | RP-67 | RP-150390 | 2855r1 |  |  | Introduction of new PHICH and PBCH performance requirements for category 0 UE | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2861 |  |  | Correction to FOOB reference in definition of MPR for contiguous CA with non-contiguous resource allocation | 12.7.0 |
| 03-2015 | RP-67 | RP-150387 | 2862 |  |  | Band 31 update | 12.7.0 |
| 03-2015 | RP-67 | RP-150384 | 2867 |  |  | Implementation of CA configurations specified in later releases | 12.7.0 |
| 06-2015 | RP-68 | RP-150958 | 2870r2 |  |  | Intra-band contiguous CA reference sensitivity definition for Class D | 12.8.0 |
| 06-2015 | RP-68 | RP-150961 | 2881r2 |  |  | CR on MTC CQI tests | 12.8.0 |
| 06-2015 | RP-68 | RP-150962 | 2882r2 |  |  | CR on 256QAM demodulation performance requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150962 | 2883r3 |  |  | CR on 256QAM sustained data rate tests for single carrier and TDD or FDD CA | 12.8.0 |
| 06-2015 | RP-68 | RP-150962 | 2885r4 |  |  | CR on 256QAM CQI test | 12.8.0 |
| 06-2015 | RP-68 | RP-150963 | 2886r3 |  |  | CR on DC SDR tests | 12.8.0 |
| 06-2015 | RP-68 | RP-150963 | 2887r2 |  |  | Maintenance CR for DC demodualtion performance requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2888 |  |  | CR to restore R.10-2 FDD | 12.8.0 |
| 06-2015 | RP-68 | RP-150961 | 2889r3 |  |  | Introduction of UE category 0 PDSCH/PHICH/PBCH performance requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2901 |  |  | UE to UE co-existence between B42/B43 | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2902 |  |  | Correction of maximum aggregated bandwidth for CA\_26A-41A | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 2903r2 |  |  | Introduction of TDD SU-MIMO whitening verification test | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2904 |  |  | Correction of FRC table for CA demodualtion with power imbalance | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2905r1 |  |  | Add SCell power levels for 2DL CA power imbalance test | 12.8.0 |
| 06-2015 | RP-68 | RP-150955 | 2907 |  |  | Corrections on UL transmit power for CA receiver requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2909 |  |  | Corrections to the CA power imbalance test | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 2910r1 |  |  | Clarification on RMC for D2D UE | 12.8.0 |
| 06-2015 | RP-68 | RP-150960 | 2911 |  |  | Correction on TDD eIMTA PDSCH functionality test | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2931 |  |  | 3.5 GHz out-of-band blocking | 12.8.0 |
| 06-2015 | RP-68 | RP-150965 | 2933 |  |  | Correction of FRC names | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2936 |  |  | Correction of the 3DL CA REFSENS | 12.8.0 |
| 06-2015 | RP-68 | RP-150962 | 2939r1 |  |  | CR on 256QAM sustained data rate tests for TDD FDD CA | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2940r1 |  |  | Maintenance CR for 3DL CA performance requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2941r1 |  |  | Maintenance CR for TDD FDD CA demodulation performance requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150965 | 2944 |  |  | Corrections on 2UL intra-band non-contiguous CA requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2947 |  |  | Updates to the definitions of CA capability (Rel-12) | 12.8.0 |
| 06-2015 | RP-68 | RP-150955 | 2950 |  |  | Clarification of PDSCH allocation in CSI PUSCH 3-0 feICIC tests (Rel-12) | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2956 |  |  | NS value for intra-band contiguous CA configurations not allowed A-MPR | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 2958 |  |  | Receiver spurious emissions requirements for downlink-only bands | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2959 |  |  | Amendments to MPR for uplink inter-band and intra-band non-contiguous CA | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2960r1 |  |  | NS values for secondary cells of non-contigous CA configurations | 12.8.0 |
| 06-2015 | RP-68 | RP-150955 | 2961r1 |  |  | Corrections to test configurations for intra-band non-contiguous CA | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2962 |  |  | Corrections to test configurations for 3DL inter-band CA | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2967 |  |  | Adding REFSENS exception requirements for 1+3+26 | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2971 |  |  | Corrections to NS\_22 and NS\_23 | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2972 |  |  | Corrections to 41D fallback | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 2972 |  |  | Corrections to EVM requirements for ProSe and Annex F of 36.101 | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2976 |  |  | Removal of B27 from 2UL CA\_7A\_20A co-existence protected band list | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 2977r1 |  |  | CR on corrections to D2D RF core requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150963 | 2978r1 |  |  | CR on corrections to D2D RF core requirements | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 2979 |  |  | CR clarification of RMC for DL category 0 UE HD-FDD | 12.8.0 |
| 06-2015 | RP-68 | RP-150960 | 2980r1 |  |  | Introducation of TDD eIMTA CQI requirement | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2985 |  |  | Change of 1.4MHz single carrier SNR values for multiple CA configurations | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 2992 |  |  | Clarification to spurious emission requirement for the edge of spurious domain | 12.8.0 |
| 06-2015 | RP-68 | RP-150955 | 2996 |  |  | Correction to CA\_7C A-MPR in CA-NS\_06 | 12.8.0 |
| 06-2015 | RP-68 | RP-150965 | 2998r1 |  |  | CR to update UE performance tests for UE DL category in 36.101 in Rel-12 | 12.8.0 |
| 06-2015 | RP-68 | RP-150965 | 2999 |  |  | CR to update Annex for new DL category in 36.101 in Rel-12 | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 3002 |  |  | CR for updating CA applicability rule in 36.101 in Rel-12 | 12.8.0 |
| 06-2015 | RP-68 | RP-150957 | 3005r1 |  |  | CR for Rel-12 NAICS - Definitions | 12.8.0 |
| 06-2015 | RP-68 | RP-150965 | 3012r1 |  |  | Clarification on uplink configuration for reference sensitivity of inter-band CA | 12.8.0 |
| 06-2015 | RP-68 | RP-150954 | 3018 |  |  | EVM for Intra-band contiguous UL CA for non-equal Channel BWs | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 3019 |  |  | A-MPR correction for CA\_39C CA\_NS\_07 | 12.8.0 |
| 06-2015 | RP-68 | RP-150958 | 2780r3 |  |  | Introduction of dual uplink CA into 36.101 | 13.0.0 |
| 06-2015 | RP-68 | RP-150646 | 2785r2 |  |  | Introduction of intra-band CA\_42D to TS 36.101 | 13.0.0 |
| 06-2015 | RP-68 | RP-150968 | 2951r2 |  |  | Introduction of additional 2DL inter-band CA | 13.0.0 |
| 06-2015 | RP-68 | RP-150972 | 2952r1 |  |  | Introduction of additional 3DL inter-band CA | 13.0.0 |
| 06-2015 | RP-68 | RP-150974 | 2953r2 |  |  | Introduction of 4DL inter-band CA | 13.0.0 |
| 06-2015 | RP-68 | RP-150975 | 2994r1 |  |  | Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL | 13.0.0 |
| 06-2015 | RP-68 | RP-150967 | 3011r1 |  |  | CR to 36.101: New CA bandwidth classes for FeCA | 13.0.0 |
| 06-2015 | RP-68 | RP-150668 | 3021 |  |  | Introduction of CA\_3A-40A to TS 36.101 | 13.0.0 |
| 06-2015 | RP-68 | RP-150673 | 3022 |  |  | Introduction of CA\_3A-40C to TS 36.101 | 13.0.0 |
| 09-2015 | RP-69 | RP-151479 | 3028 |  |  | Table 7.3.1A-0f (2UL CA MSD) notes numbering correction | 13.1.0 |
| 09-2015 | RP-69 | RP-151505 | 3029 |  |  | Additional bandwidth combination set for LTE Advanced intra-band non-contiguous Carrier Aggregation in Band 4 | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3031 |  |  | Correction to TDD FDD CA | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3033 |  |  | Alignment of CA Receiver requirements parameters | 13.1.0 |
| 09-2015 | RP-69 | RP-151476 | 3036 |  |  | Correction to CoMP demodulation requirements | 13.1.0 |
| 09-2015 | RP-69 | RP-151475 | 3040 |  |  | Correction to RI test parameters in TS 36.101 (Rel-13) | 13.1.0 |
| 09-2015 | RP-69 | RP-151475 | 3050 |  |  | UE co-existence requirements between Band 42 and Japanese bands | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3052 |  |  | Introduction of relaxation rule for multiple 3DL inter-band CA configurations | 13.1.0 |
| 09-2015 | RP-69 | RP-151491 | 3056r1 |  |  | Adding CA\_42D to the out of band blocking requirement exception | 13.1.0 |
| 09-2015 | RP-69 | RP-151501 | 3057r1 |  |  | Introduction of finished 4DL inter-band CAs to TS 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151487 | 3060r1 |  |  | Corrections on CA reference sensitivity requirements | 13.1.0 |
| 09-2015 | RP-69 | RP-151476 | 3064 |  |  | Correction to RC.2 TDD Nr. HARQ Proc. into TS36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3065 |  |  | Corrections to CSI PUCCH 1-0 static test 4 and PUSCH 3-2 tests | 13.1.0 |
| 09-2015 | RP-69 | RP-151488 | 3066 |  |  | Corrections in Table 5.6A.1-2, 7.3.1-1A and 7.3.1-1B. | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3068 |  |  | Corrections of Spurious emission band UE co-existence for interband 2UL CA in Table 6.6.3.2A-0 | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3070 |  |  | Revisions of Spurious emission band UE co-existence in Table 6.6.3.2-1 | 13.1.0 |
| 09-2015 | RP-69 | RP-151475 | 3076 |  |  | Correction to PDCCH/PCFICH test parameters in TS 36.101 (Rel-13) | 13.1.0 |
| 09-2015 | RP-69 | RP-151475 | 3080 |  |  | Correction to PMI delay in PMI test for TDD | 13.1.0 |
| 09-2015 | RP-69 | RP-151503 | 3081r1 |  |  | Introduction of dual uplink CA into 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3083 |  |  | Maintanence CR for MTC CSI performance requirements | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3085 |  |  | Maintanence CR for SCE demodulation and CSI requriements | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3087 |  |  | Maintenance CR for DC demodulation performance requirements and SDR tests | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3089 |  |  | Cleanup of TDD-FDD CA demodulation performance requirments | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3091 |  |  | Cleanup of R12 SU-MIMO Enhanced Performance Type C requirments | 13.1.0 |
| 09-2015 | RP-69 | RP-151475 | 3102 |  |  | Correction on UE maximum output power class of Band 22 for UL MIMO | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3104 |  |  | Removal of square brackets for Cat-0 UE demodulation requirements | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3106 |  |  | Removal of square brackets for LTE-CA\_B41\_B42 | 13.1.0 |
| 09-2015 | RP-69 | RP-151490 | 3107 |  |  | Removal of square brackets for LTE-CA\_B41\_B42\_B42 | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3112 |  |  | Corrections on 3DL CA performance requirements | 13.1.0 |
| 09-2015 | RP-69 | RP-151489 | 3113 |  |  | CR 36.101 BW combination for CA\_8A\_41A | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3114 |  |  | UL DL pairing for CA of B39+B41+B41 and B39+B39+B41 | 13.1.0 |
| 09-2015 | RP-69 | RP-151498 | 3116 |  |  | Introduction of additional band combinations for 2DL inter-band CA | 13.1.0 |
| 09-2015 | RP-69 | RP-151499 | 3117 |  |  | Introduction of additional band combinations for 3DL inter-band CA | 13.1.0 |
| 09-2015 | RP-69 | RP-151475 | 3118 |  |  | Minor corrections in 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3121 |  |  | CR adding clarification for Band 28 restrictions in 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151494 | 3123r1 |  |  | Introduction of propagation conditions to handle 4 receivers in the UE | 13.1.0 |
| 09-2015 | RP-69 | RP-151504 | 3125r1 |  |  | Addition on interband CA 2UL/3DL pairs without MSD | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3127 |  |  | CR for UE performance tests for intra-band contiguous CA with minimum channel spacing on Band 41 | 13.1.0 |
| 09-2015 | RP-69 | RP-151496 | 3130r2 |  |  | TM9 performance with CRS assistance information | 13.1.0 |
| 09-2015 | RP-69 | RP-151495 | 3133r1 |  |  | Introduction of UL 64QAM to TS 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3135r1 |  |  | Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) | 13.1.0 |
| 09-2015 | RP-69 | RP-151485 | 3137 |  |  | CR to add demodulation tests for new release 13 2CC combinations in 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151501 | 3139r1 |  |  | Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3141 |  |  | Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table | 13.1.0 |
| 09-2015 | RP-69 | RP-151473 | 3143r1 |  |  | Correction to DC supported testable bandwidth list | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3145 |  |  | Clarification of UL configuration for CA demodulation requirements | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3146r1 |  |  | Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA | 13.1.0 |
| 09-2015 | RP-69 | RP-151502 | 3147 |  |  | Correction to dRib and REFSENS | 13.1.0 |
| 09-2015 | RP-69 | RP-151479 | 3153 |  |  | Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) | 13.1.0 |
| 09-2015 | RP-69 | RP-151483 | 3155 |  |  | Corrections to applicability of CSI requirements for low UE categories (Rel-13) | 13.1.0 |
| 09-2015 | RP-69 | RP-151482 | 3164 |  |  | CR for Rel-12 NAICS - Demodulation Test | 13.1.0 |
| 09-2015 | RP-69 | RP-151482 | 3165 |  |  | CR for Rel-12 NAICS - Fixed Reference Channels | 13.1.0 |
| 09-2015 | RP-69 | RP-151482 | 3166 |  |  | CR for Rel-12 NAICS - Interference Models | 13.1.0 |
| 09-2015 | RP-69 | RP-151482 | 3167 |  |  | CR for Rel-12 NAICS - CQI Tests | 13.1.0 |
| 09-2015 | RP-69 | RP-151205 | 3168 |  |  | Introduction of CA\_7A-40A and CA\_7A-40C to TS 36.101 | 13.1.0 |
| 09-2015 | RP-69 | RP-151593 | 3170 |  |  | CR for Rel-13 NAICS – TM10 Demodulation and CSI Test | 13.1.0 |
| 12-2015 | RP-70 | RP-152158 | 3172r1 |  |  | Introduction of UE RF requriements for CA\_42E | 13.2.0 |
| 12-2015 | RP-70 | RP-152137 | 3173 |  |  | Correction on UL 64QAM measurment channels | 13.2.0 |
| 12-2015 | RP-70 | RP-152131 | 3175 |  |  | Release 13 CAT A CR to align NS\_04 values to meet FCC OOBE requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3178 |  |  | Maintenance of eIMTA PDSCH demodulation test | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3180r1 |  |  | Correction for eIMTA CQI tests | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3186 |  |  | Simplified CA fading Test method becomes optional | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3191 |  |  | Correction of the applicable UE categories for 256QAM UE demodulation performance requirements (Rel-13) | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3193r1 |  |  | Correction of TDD-FDD CA performance requirements (Rel-13) | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3195r1 |  |  | Correction on FDD CA and TDD CA performance requirements (Rel-13) | 13.2.0 |
| 12-2015 | RP-70 | RP-152163 | 3196 |  |  | CR on introduction of 5CC FDD/TDD CA demodulation performance requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152163 | 3197 |  |  | CR on introduction of 5CC TDD FDD CA demodulation performance requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152132 | 3205 |  |  | Correction of the AMPR table for NS\_14 in TS 36.101 R13 | 13.2.0 |
| 12-2015 | RP-70 | RP-152134 | 3206 |  |  | Correction of the 2UL CA co-existence table for CA\_18A-28A | 13.2.0 |
| 12-2015 | RP-70 | RP-152152 | 3209 |  |  | Introduction of 3DL/2UL DC | 13.2.0 |
| 12-2015 | RP-70 | RP-152139 | 3210r1 |  |  | Correction of uplink configuration for CA\_42D | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3212 |  |  | Introduction of dual uplink CA into 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3214 |  |  | Corrections to the CSI minimum requirement for PUSCH 3-2 (Rel-13) | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3216 |  |  | Corrections to MIMO Correlation Matrices using cross polarized antennas (Rel-12) | 13.2.0 |
| 12-2015 | RP-70 | RP-152157 | 3221r1 |  |  | Introducing B20 + B67 CA into TS 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3225 |  |  | CR for UE performance tests for intra-band contiguous CA with minimum channel spacing on Band 41 | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3227r1 |  |  | Correction in SNR definition for CSI test | 13.2.0 |
| 12-2015 | RP-70 | RP-152130 | 3232 |  |  | Correction to reference channel for CQI requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152168 | 3233r1 |  |  | CR 36.101 BW combination for CA\_8B | 13.2.0 |
| 12-2015 | RP-70 | RP-152164 | 3241 |  |  | Correction to mandatory 2UL support for 3DL interband CA | 13.2.0 |
| 12-2015 | RP-70 | RP-152164 | 3242 |  |  | Introduction of 2 UL and 3 DL interband cases with MSD | 13.2.0 |
| 12-2015 | RP-70 | RP-152132 | 3246 |  |  | CR on FRC for CDM-multiplexed DM RS | 13.2.0 |
| 12-2015 | RP-70 | RP-152132 | 3249 |  |  | Correction to physical channel for CQI reporting in type A test case | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3255 |  |  | CR for Rel-12 NAICS - Demodulation Test | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3263 |  |  | Correction on CA\_4A-4A-5A table reference | 13.2.0 |
| 12-2015 | RP-70 | RP-152134 | 3269r1 |  |  | Clarification of Pcell support in 36.101 in CA scenarios | 13.2.0 |
| 12-2015 | RP-70 | RP-152132 | 3273 |  |  | A-MPR correction for CA\_NS\_06 CA-7C non-contiguous RB allocation | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3276 |  |  | Clarification on relative power tolereance for CA | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3278 |  |  | Correction of uplink configuration for CA\_18-28 | 13.2.0 |
| 12-2015 | RP-70 | RP-152135 | 3280 |  |  | CR on corrections for ProSe Direct Discovery demodulation requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152135 | 3281 |  |  | CR to finalize demodulation performance requirements for D2D Communication | 13.2.0 |
| 12-2015 | RP-70 | RP-152131 | 3285 |  |  | Missing RB allocation and OCNG Pattern for Cat 1 UEs in Multiple PMI CSI Reference Symbol tests | 13.2.0 |
| 12-2015 | RP-70 | RP-152167 | 3286r1 |  |  | Introduction of CA\_5B to TS 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152169 | 3287 |  |  | Introduction of CA\_5A-5A to TS 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3288 |  |  | Introduction of dual uplink CA into 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152150 | 3291r1 |  |  | CR on eD2D RF core requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152171 | 3292r3 |  |  | Introduction of B65 in Region 1 | 13.2.0 |
| 12-2015 | RP-70 | RP-152131 | 3294 |  |  | Correction of supported sub-block frequency arrangement for CA\_41-41 | 13.2.0 |
| 12-2015 | RP-70 | RP-152131 | 3296 |  |  | Correction of test configuration for combinations of inter-band and intra-band CA | 13.2.0 |
| 12-2015 | RP-70 | RP-152147 | 3299r2 |  |  | RF receiver requirements for UE(s) supporting four antenna ports | 13.2.0 |
| 12-2015 | RP-70 | RP-152148 | 3300r2 |  |  | Introduction of RF requirements for LAA operation | 13.2.0 |
| 12-2015 | RP-70 | RP-152172 | 3309r2 |  |  | Introduction of Band 66 | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3311 |  |  | Correction on CQI test 1A for TDD eIMTA | 13.2.0 |
| 12-2015 | RP-70 | RP-152166 | 3312r1 |  |  | Introduction of 3DL/3UL Inter-band CA of CA\_39A-41C and CA\_39C-41A | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3314 |  |  | Correction of the resource allocation in FRC for CAT0 UE demodulation tests | 13.2.0 |
| 12-2015 | RP-70 | RP-152151 | 3318 |  |  | Introduce TM4 performance requirements when CRS assistance information is provided | 13.2.0 |
| 12-2015 | RP-70 | RP-152151 | 3319r1 |  |  | Introduce TM10 performance requirements when CRS assistance information is provided for multiple-CSI-process capable UE | 13.2.0 |
| 12-2015 | RP-70 | RP-152151 | 3320r1 |  |  | Introduce TM10 performance requirements when CRS assistance information is provided for one-CSI-process capable UE | 13.2.0 |
| 12-2015 | RP-70 | RP-152163 | 3325 |  |  | Introduction of 5DL/1UL CA combinations into TS 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152175 | 3326r1 |  |  | Introduction of Region 3 requirement in Band 65 | 13.2.0 |
| 12-2015 | RP-70 | RP-152138 | 3327 |  |  | Correction of CA\_8A-41C bandwidth combination set | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3329 |  |  | Removal of DC channel bandwidth combination set table | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3331 |  |  | CR on demodulation requirements of Dual Connectivity | 13.2.0 |
| 12-2015 | RP-70 | RP-152131 | 3332r1 |  |  | Modification and correction of CA\_3A-3A BCS1 in Rel.13 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152133 | 3334 |  |  | Correction of MSD levels for 2UL inter-band CA in TS 36.101 Rel-13 | 13.2.0 |
| 12-2015 | RP-70 | RP-152162 | 3338 |  |  | Introduction of finished 4DL inter-band CAs to TS 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152170 | 3339 |  |  | Introduction of CA\_7A-7A BCS1 to TS 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152164 | 3340r1 |  |  | Introduction of additional 2 UL and 3 DL interband cases with MSD | 13.2.0 |
| 12-2015 | RP-70 | RP-152158 | 3341r1 |  |  | Addition of Class E into CA BW Class table. | 13.2.0 |
| 12-2015 | RP-70 | RP-152131 | 3343 |  |  | Table 6.2.4A-1 note 1 correction | 13.2.0 |
| 12-2015 | RP-70 | RP-152164 | 3345 |  |  | Removal of (NOTE 4) from Table 5.6A.1-2a | 13.2.0 |
| 12-2015 | RP-70 | RP-152160 | 3347 |  |  | Introduction of 4DL NC CA in band42 in 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152173 | 3348 |  |  | Introduction of 1447-1467MHz Band into 36.101 | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3352 |  |  | CR: PDSCH ETU600 performance requirements | 13.2.0 |
| 12-2015 | RP-70 | RP-152156 | 3357 |  |  | Introduction of additional band combinations for 2DL inter-band CA | 13.2.0 |
| 12-2015 | RP-70 | RP-151972 | 3358r2 |  |  | Revision of the RAN4 approved R4-158446 (big CR 3DL 36.101) | 13.2.0 |
| 12-2015 | RP-70 | RP-152147 | 3359r1 |  |  | Introduction of the Medium Correlation A model | 13.2.0 |
| 12-2015 | RP-70 | RP-152147 | 3360r1 |  |  | Requirements for ePDCCH with 4Rx | 13.2.0 |
| 12-2015 | RP-70 | RP-152147 | 3361r1 |  |  | Requirements for PDCCH with 4Rx | 13.2.0 |
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| 12-2015 | RP-70 | RP-152147 | 3363r1 |  |  | Requirements for PHICH with 4Rx | 13.2.0 |
| 12-2015 | RP-70 | RP-152159 | 3367r1 |  |  | Introduction of intra-band non-contiguous CA in Band 41 for 4DL | 13.2.0 |
| 12-2015 | RP-70 | RP-152165 | 3368 |  |  | Addition of 2 UL and 3 DL mixed intra/inter band carrier aggregation combinations without MSD. | 13.2.0 |
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| 12-2015 | RP-70 | RP-152133 | 3375 |  |  | Correction to Pcmax for CA to include delta\_T\_ProSe | 13.2.0 |
| 12-2015 | RP-70 | RP-152162 | 3376 |  |  | Delta TIB,c and Delta RIB,c for 1UL/4DL | 13.2.0 |
| 12-2015 | RP-70 | RP-152136 | 3378 |  |  | NS\_05 modification for PHS protection in Japan | 13.2.0 |
| 01-2016 | RP-70 |  |  |  |  | Edotorial correction: Correction of reference to section 6.6.3.3.19 for NS\_04 in Table 6.2.4-1 | 13.2.1 |
| 03/2016 | RP-71 | RP-160472 | 3467 | 1 | B | UE receiver requirements for Rel-13 MTC | 13.3.0 |
| 03/2016 | RP-71 | RP-160472 | 3443 | 1 | B | CR on TX requirements for Rel-13 eMTC | 13.3.0 |
| 03/2016 | RP-71 | RP-160474 | 3419 |  | B | Introduce Robustness test for CRS-IM capable UE | 13.3.0 |
| 03/2016 | RP-71 | RP-160474 | 3422 | 1 | B | FRC for non-TM10 with CRS assistance information | 13.3.0 |
| 03/2016 | RP-71 | RP-160474 | 3420 | 1 | B | Introduce non-TM10 performance with CRS assistance information | 13.3.0 |
| 03/2016 | RP-71 | RP-160474 | 3421 | 1 | B | Introduce TM10 performance with CRS assistance information | 13.3.0 |
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| 03/2016 | RP-71 | RP-160479 | 3462 |  | B | Correction of Correlation Model for Medium Correlation A | 13.3.0 |
| 03/2016 | RP-71 | RP-160479 | 3466 |  | B | UE Demodulation Requirements for DL Control channels for 4Rx | 13.3.0 |
| 03/2016 | RP-71 | RP-160479 | 3463 | 1 | B | UE Demodulation Requirements for DL PDSCH rank 1 and 2 performance | 13.3.0 |
| 03/2016 | RP-71 | RP-160479 | 3464 | 1 | B | UE Demodulation Requirements for DL PDSCH rank 3 and 4 requirements | 13.3.0 |
| 03/2016 | RP-71 | RP-160479 | 3412 | 2 | F | Corrections to UE RF receiver requirements for 4RX AP and support of CA | 13.3.0 |
| 03/2016 | RP-71 | RP-160480 | 3431 |  | B | Introduction of additional band combinations for 3DL inter-band CA | 13.3.0 |
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| 03/2016 | RP-71 | RP-160483 | 3415 | 2 | B | Introduction of Band 68 for Arab region into 36.101 | 13.3.0 |
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| 03/2016 | RP-71 | RP-160489 | 3411 |  | A | Correction of Pcmax for Dual Connectivity | 13.3.0 |
| 03/2016 | RP-71 | RP-160489 | 3436 |  | A | Correction on UE category in Annex of TS 36.101 | 13.3.0 |
| 03/2016 | RP-71 | RP-160489 | 3438 |  | A | Removal of brackets for Maximum input level for 256QAM in TS 36.101 | 13.3.0 |
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| 03/2016 | RP-71 | RP-160489 | 3458 |  | A | CR: Correction of FRC for SDR test (Rel-13) | 13.3.0 |
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| 03/2016 | RP-71 | RP-160490 | 3427 |  | F | Corrections to Notes in 2UL spurious emission table | 13.3.0 |
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| 03/2016 | RP-71 | RP-160490 | 3473 |  | D | CR of editorial change on PHICH group and Ng in Rel-13 | 13.3.0 |
| 03/2016 | RP-71 | RP-160490 | 3477 |  | F | Supported bandwidths for Band 66 | 13.3.0 |
| 03/2016 | RP-71 | RP-160490 | 3478 |  | F | Corrections to CA\_66C | 13.3.0 |
| 03/2016 | RP-71 | RP-160490 | 3441 | 1 | F | Correction on Annex D for LAA in TS 36.101 | 13.3.0 |
| 03/2016 | RP-71 | RP-160490 | 3406 | 3 | F | Correction to UL 64 QAM measurement channels in TS 36.101 | 13.3.0 |
| 03/2016 | RP-71 | RP-160490 | 3430 | 3 | F | Corrections and bracket removals to B46 specifications | 13.3.0 |
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| 06/2016 | RP-72 | RP-161141 | 3491 |  | A | Square brackets on B39 single carrier spurious emission requirements for protecting B3 | 13.4.0 |
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| 06/2016 | RP-72 | RP-161142 | 3493 |  | F | CR to Correct Notes for CA REFSENS Tables | 13.4.0 |
| 06/2016 | RP-72 | RP-161142 | 3494 |  | D | Editorial modification on uplink inter-band CA | 13.4.0 |
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| 06/2016 | RP-72 | RP-161142 | 3531 | 1 | F | Correction on eMTC in TS 36.101 | 13.4.0 |
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| 06/2016 | RP-72 | RP-161142 | 3551 | 2 | F | Correction on eMTC In-band emissions in TS 36.101 | 13.4.0 |
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| 06/2016 | RP-72 | RP-161142 | 3578 |  | F | Corrections of CA 8A-42A/C in REL-13 | 13.4.0 |
| 06/2016 | RP-72 | RP-161142 | 3579 | 1 | F | CR on control channel requirements of 4 Rx UE | 13.4.0 |
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| 06/2016 | RP-72 | RP-161126 | 3589 |  | B | Category NB1 CR for 36.101 | 13.4.0 |
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| 06/2016 | RP-72 | RP-161136 | 3593 | 1 | B | CR on PHICH performance requirements for DL control channel IM | 13.4.0 |
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| 06/2016 | RP-72 | RP-161133 | 3597 | 1 | B | Finalization of 4Rx UE Demodulation Requirements | 13.4.0 |
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| 06/2016 | RP-72 | RP-161142 | 3632 | 1 | F | CR for TM9 tests with MBSFN subframes configured for PDSCH in Rel-13 | 13.4.0 |
| 06/2016 | RP-72 | RP-161133 | 3633 | 2 | B | CR for applicability rule, antenna connection and test method for 4Rx UEs in Rel-13 | 13.4.0 |
| 06/2016 | RP-72 | RP-161136 | 3634 | 1 | B | CR of introducing enhanced control channels requirements under asynchronous network in Rel-13 | 13.4.0 |
| 06/2016 | RP-72 | RP-161139 | 3635 | 1 | F | Reference sensitivity for combinations of inter-band and NC intra-band CA | 13.4.0 |
| 06/2016 | RP-72 | RP-161142 | 3636 | 1 | F | Correction to A-MPR for NS\_26 | 13.4.0 |
| 06/2016 | RP-72 | RP-161136 | 3640 | 1 | B | CR for applicability rule for control channel enhancement requirements in Rel-13 | 13.4.0 |
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| 2016/06 | RP-72 | RP-161125 | 3553 | - | B | Introduction of B70 to TS36.101 | 14.0.0 |
| 2016/06 | RP-72 | RP-161124 | 3577 | 1 | B | Introduction of 2.6GHz SDL and CA B3\_2.6SDL | 14.0.0 |
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| 2016/06 | RP-72 | RP-161123 | 3582 | - | B | Introduction of new 4DL/2UL CA band combination in Rel-14 | 14.0.0 |
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| 2016/06 | RP-72 | RP-161121 | 3588 | - | B | Introduction of Rel-14 5DL inter-band combinations in 36.101 | 14.0.0 |
| 2016/06 | RP-72 | RP-161122 | 3603 | - | B | Introduction of completed R14 2DL2UL band combinations to TS 36.101 | 14.0.0 |
| 2016/06 | RP-72 | RP-161118 | 3604 | - | B | Introduction of completed R14 3DL band combination to TS 36.101 | 14.0.0 |
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| 09/2016 | RP-73 | RP-161784 | 3663 |  | A | Correction of CA REFSENS harmonic formula | 14.1.0 |
| 09/2016 | RP-73 | RP-161635 | 3665 |  | A | Adding UL configuration for CA\_28A-42A and CA\_28A-42C | 14.1.0 |
| 09/2016 | RP-73 | RP-161622 | 3667 |  | B | Introduction of completed R14 2DL band combinations to TS 36.101 | 14.1.0 |
| 09/2016 | RP-73 | RP-161629 | 3672 |  | A | CR: Update the power level setting for tests 8.3.1.2 and 8.3.2.3 (Rel-14) | 14.1.0 |
| 09/2016 | RP-73 | RP-161782 | 3678 |  | A | CR for eMTC M-PDCCH demodulation requirement for CE Mode B (Rel-14) | 14.1.0 |
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| 03/2017 | RP-75 | RP-170563 | 4149 | 1 | B | CR for PDSCH demodulation test for Cat.1 UE with single Rx antenna | 14.3.0 |
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| 03/2017 | RP-75 | RP-170575 | 4169 |  | B | Release 14 CR to 36.101 to add Bands 25 and 26 to Category 0 | 14.3.0 |
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| 03/2017 | RP-75 | RP-170566 | 4182 |  | F | Correction of Rel-14 CA configurations and relaxation values | 14.3.0 |
| 03/2017 | RP-75 | RP-170566 | 4183 | 1 | F | Correction of Rel-14 CA REFSENS exceptions | 14.3.0 |
| 03/2017 | RP-75 | RP-170603 | 4185 |  | A | Correction of Rel-13 CA REFSENS exceptions | 14.3.0 |
| 03/2017 | RP-75 | RP-170553 | 4190 | 2 | B | Introduction of UE requirements for LAA Scell uplink operation in Band 46 | 14.3.0 |
| 03/2017 | RP-75 | RP-170597 | 4192 |  | A | Finalize eMTC PDSCH demodulation requirements | 14.3.0 |
| 03/2017 | RP-75 | RP-170597 | 4194 |  | A | Finalize eMTC CQI test requirements | 14.3.0 |
| 03/2017 | RP-75 | RP-170594 | 4198 |  | A | Correction of FRC table for eMTC RF test | 14.3.0 |
| 03/2017 | RP-75 | RP-170590 | 4201 |  | F | CR on correction of enhanced ePDCCH performance requirements for DL control channel IM | 14.3.0 |
| 03/2017 | RP-75 | RP-170592 | 4204 |  | A | Clean up and correction for LAA PDCCH demodulation requirements | 14.3.0 |
| 03/2017 | RP-75 | RP-170599 | 4208 | 1 | A | PCMAX tolerance for UE Cat NB1 power class 5 | 14.3.0 |
| 03/2017 | RP-75 | RP-170558 | 4209 | 1 | B | Addition of uplink 256 QAM feature to TS 36.101 | 14.3.0 |
| 03/2017 | RP-75 | RP-170580 | 4213 |  | A | Addition of missing note for bands 7 and 39 UE to UE co-ex | 14.3.0 |
| 03/2017 | RP-75 | RP-170580 | 4217 |  | A | Correction of CA\_NS\_06 non-contiguous resource allocation MPR formula | 14.3.0 |
| 03/2017 | RP-75 | RP-170598 | 4218 | 1 | A | Corrections in TS 36.101 for NB-IoT UE | 14.3.0 |
| 03/2017 | RP-75 | RP-170592 | 4221 | 1 | F | CR for LAA SDR applicability | 14.3.0 |
| 03/2017 | RP-75 | RP-170592 | 4223 | 1 | F | CR: Updates to LAA PDSCH demodulation performance requirements and LBT(R14) | 14.3.0 |
| 03/2017 | RP-75 | RP-170598 | 4225 |  | A | CR: Scheduling pattern for NPUSCH format 1 and NPDSCH in NB-IoT RF test(R14) | 14.3.0 |
| 03/2017 | RP-75 | RP-170601 | 4227 |  | A | CR:Updates to the overview of RMC for NB-IoT(R14) | 14.3.0 |
| 03/2017 | RP-75 | RP-170601 | 4229 |  | A | CR:Cleanup for NB-IoT UE demod performance requirements(R14) | 14.3.0 |
| 03/2017 | RP-75 | RP-170585 | 4232 |  | A | Corrections for D2D resource configuration (Rel-14) | 14.3.0 |
| 03/2017 | RP-75 | RP-170555 | 4233 | 1 | F | CR for UE enhancement in SFN scenario | 14.3.0 |
| 03/2017 | RP-75 | RP-170595 | 4235 |  | A | clean up the CR for eMTC PBCH requirements(Rel-14) | 14.3.0 |
| 03/2017 | RP-75 | RP-170585 | 4243 |  | A | CR for fixing requirement for soft buffer test for TDD-FDD CA in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170587 | 4245 |  | A | CR for fixing power ratio errors in 4Rx tests in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170562 | 4246 | 1 | B | CR for defining requirements for normal demodulation tests for 4Rx CA in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170562 | 4247 | 1 | B | CR for introducing normal demodulation tests for 4Rx TDD-FDD CA in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170562 | 4249 | 1 | B | CR for introducing applicability rule for normal demodulation tests | 14.3.0 |
| 03/2017 | RP-75 | RP-170562 | 4251 | 1 | B | CR for introducing new demodulation tests for 4Rx DC in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170587 | 4254 |  | A | CR for correcting applicability rules for 4Rx tests in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170571 | 4256 |  | B | Introduction of additional 3DL/2UL CA band combinations in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170571 | 4257 |  | B | Introduction of new 4DL/2UL CA band combination in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170571 | 4258 |  | B | Introduction of new 5DL/2UL CA band combination in Rel-14 | 14.3.0 |
| 03/2017 | RP-75 | RP-170559 | 4262 | 2 | B | CR on intra-band contiguous MCC for V2X for TS 36.101 | 14.3.0 |
| 03/2017 | RP-75 | RP-170561 | 4263 | 2 | B | Introduction of a new power class for NB-IoT | 14.3.0 |
| 03/2017 | RP-75 | RP-170570 | 4264 |  | B | Introduction of completed R14 2DL2UL band combinations to TS 36.101 | 14.3.0 |
| 03/2017 | RP-75 | RP-170567 | 4266 |  | B | Introduction of completed R14 3DL band combinations to TS 36.101 | 14.3.0 |
| 03/2017 | RP-75 | RP-170574 | 4267 | 1 | B | Introduction of bands to support 4Rx APs to TS 36.101 | 14.3.0 |
| 03/2017 | RP-75 | RP-170578 | 4268 | 1 | F | CR for remaining issues for V2V UE RF requirements | 14.3.0 |
| 03/2017 | RP-75 | RP-170559 | 4269 |  | B | Introduction of inter-band con-current V2X UE RF requirements | 14.3.0 |
| 03/2017 | RP-75 | RP-170559 | 4271 | 1 | B | CR for Tx RF requirements for high power V2X | 14.3.0 |
| 03/2017 | RP-75 | RP-170577 | 4274 |  | F | Correction to Band 70 use on 20 MHz channel bandwidth | 14.3.0 |
| 03/2017 | RP-75 | RP-170598 | 4279 |  | A | CR for clarification on SEM of category NB1 [Rel-14] | 14.3.0 |
| 03/2017 | RP-75 | RP-170594 | 4280 |  | A | CR of TX-RX frequency separation for category M1 [Rel-14] | 14.3.0 |
| 03/2017 | RP-75 | RP-170587 | 4282 |  | A | CR for fixing antenna configuration for TDD CQI rank 3 test for 4Rx in Rel-13 | 14.3.0 |
| 03/2017 | RP-75 | RP-170594 | 4285 |  | A | Reference Channels for partial RB allocation for UE UL category M1 | 14.3.0 |
| 03/2017 | RP-75 | RP-170566 | 4290 |  | B | Introduction of completed R14 2DL band combinations to TS 36.101 | 14.3.0 |
| 03/2017 | RP-75 | RP-170559 | 4293 |  | B | CR for single carrier V2X UE RF requirements | 14.3.0 |
| 06/2017 | RP-76 | RP-171304 | 4299 |  | A | Correction to 4Tx/4Rx Cell-specific reference signals in Table 8.10.1.1.7-1 | 14.4.0 |
| 06/2017 | RP-76 | RP-171269 | 4302 | 1 | F | Introduction of Band 18 UE category 1bis into TS36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171257 | 4304 | 1 | F | eHST RF: Practical and consistent model definition for HST-SFN scenario (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171308 | 4306 |  | A | Correction to UL and DL Reference Channels for Cat M1 UE | 14.4.0 |
| 06/2017 | RP-76 | RP-171296 | 4309 |  | A | Corrections for D2D FRCs | 14.4.0 |
| 06/2017 | RP-76 | RP-171279 | 4313 | 3 | B | Intorduction of new bands for NB-IoT in 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171269 | 4314 | 1 | F | CR for correction for CQI test for Cat.1 UE with single Rx antenna | 14.4.0 |
| 06/2017 | RP-76 | RP-171395 | 4318 |  | A | Correction to SEM table for intra-band 2UL CA | 14.4.0 |
| 06/2017 | RP-76 | RP-171310 | 4320 |  | A | Cleanup of eMTC UE demodulation requirements (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171311 | 4322 | 1 | A | Correction for FD-MIMO demodulation test (R14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171278 | 4327 | 1 | F | CR on correction for multiple MSD requirements for dual uplink CA UE | 14.4.0 |
| 06/2017 | RP-76 | RP-171282 | 4329 | 1 | F | CR on correction for V2X con-current operation | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4332 | 1 | B | CR for introducing requirements for normal demodulation tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4333 |  | B | CR for introducing for TDD-FDD DC normal demodulation tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4334 | 1 | B | CR for introducing new IRC tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4336 | 1 | F | CR for fixing errors of 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171285 | 4339 |  | F | CR for correction of eLAA UE RF requirements | 14.4.0 |
| 06/2017 | RP-76 | RP-171307 | 4356 | 1 | F | CR for LAA extension for PDSCH perfortmance with multiple CCs in unlicensed bands | 14.4.0 |
| 06/2017 | RP-76 | RP-171301 | 4358 |  | A | Correction of NPDSCH and NPDCCH | 14.4.0 |
| 06/2017 | RP-76 | RP-171304 | 4360 |  | A | Maintenance CR for 4Rx WI (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171310 | 4367 |  | F | CR for PDSCH fixed reference channel (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171304 | 4373 |  | A | CR on 4-RX TM9 MU-MIMO performance requirements (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171298 | 4375 |  | A | CR on PDCCH/PCFICH DL Control Channel IM Type A TDD test case correction (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171048 | 4379 | 1 | B | Addition of Band 28 UE category 1bis into TS 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171282 | 4380 | 1 | F | CR on applicability of V2X contiguous intraband multi-carrier operation requirements. | 14.4.0 |
| 06/2017 | RP-76 | RP-171309 | 4383 |  | A | Correction to Table A.4-1 and A.4-16 for CatM1. | 14.4.0 |
| 06/2017 | RP-76 | RP-171310 | 4385 |  | A | Correction to minimum requirement for CatM1 Single-Layer Spatial Multiplexing | 14.4.0 |
| 06/2017 | RP-76 | RP-171300 | 4389 |  | A | CR for demodulation of NB-IoT correction (Rel.14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171307 | 4391 |  | A | CR for LAA TDD test case correction (Rel.14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171395 | 4397 |  | F | Correction to the table of intra-band non-contiguous CA with one uplink configuration for reference sensitivity | 14.4.0 |
| 06/2017 | RP-76 | RP-171263 | 4398 | 1 | B | CR on performance requirements for MUST Case 1 and Case 2 | 14.4.0 |
| 06/2017 | RP-76 | RP-171263 | 4399 | 1 | B | CR on performance requirements for MUST Case 3 | 14.4.0 |
| 06/2017 | RP-76 | RP-171263 | 4400 |  | B | CR on Fixed Reference Channels for MUST | 14.4.0 |
| 06/2017 | RP-76 | RP-171263 | 4401 | 1 | B | CR on applicability rule for MUST Case 3 | 14.4.0 |
| 06/2017 | RP-76 | RP-171297 | 4405 |  | A | Correction of N\_RB\_agg for CA\_41C and CA\_7C in Table 7.3.1A-1 | 14.4.0 |
| 06/2017 | RP-76 | RP-171296 | 4412 |  | A | Correction to Mapping of CQI Index to Modulation coding scheme for 256QAM | 14.4.0 |
| 06/2017 | RP-76 | RP-171304 | 4414 |  | A | CR for correction of 4RX demodulation requirements (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171278 | 4417 |  | B | Introduction of new 3DL/2UL CA band combinations in rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171278 | 4418 |  | B | Introduction of new 4DL/2UL CA band combination in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171290 | 4419 | 1 | F | Correction on the additional SE for Band 41 UE in rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171282 | 4420 | 1 | F | CR on V2X Pumax for non-concurrent operaion | 14.4.0 |
| 06/2017 | RP-76 | RP-171311 | 4424 |  | A | Correction of test points for Single-antenna port performance TDD FDD CA | 14.4.0 |
| 06/2017 | RP-76 | RP-171272 | 4425 | 1 | B | Introduction of additional band combinations for Intra-band CA | 14.4.0 |
| 06/2017 | RP-76 | RP-171275 | 4426 | 2 | B | Introduction of Rel-14 4DL/1UL combinations in 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171282 | 4428 |  | F | Clean ups of TS36.101 for V2X requirements | 14.4.0 |
| 06/2017 | RP-76 | RP-171256 | 4432 | 1 | B | CR for V2V Performance Requirements | 14.4.0 |
| 06/2017 | RP-76 | RP-171261 | 4433 |  | B | CR to 36.101: Introduction of FeMBMS numerologies | 14.4.0 |
| 06/2017 | RP-76 | RP-171285 | 4435 | 1 | F | Correction to A-MPR tables and in-band emissions for eLAA | 14.4.0 |
| 06/2017 | RP-76 | RP-171304 | 4437 |  | A | CR for FRC overview table for 4 layer SDR tests (R14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171269 | 4438 |  | D | Maintenance CR for demodulation and CQI tests for Cat.1bis UE | 14.4.0 |
| 06/2017 | RP-76 | RP-171307 | 4440 | 1 | A | Maintenance CR for LAA demodulation tests | 14.4.0 |
| 06/2017 | RP-76 | RP-171274 | 4441 |  | F | Correction on uplink limitation of 3DL CA 8A-11A-28A | 14.4.0 |
| 06/2017 | RP-76 | RP-171282 | 4442 |  | F | Some corrections on V2X in TS 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171273 | 4443 |  | B | Introduction of completed R14 2DL band combinations to TS 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171274 | 4444 |  | B | Introduction of completed R14 3DL band combinations to TS 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171304 | 4446 | 1 | F | 4Rx REFSENS requirements spec improvement for 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171311 | 4448 |  | A | CR for adding TDD 4 DL CA bandwidth combination for CQI CA tests in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171304 | 4450 |  | A | CR for adding applicability rule for MU TM9 4Rx tests in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4451 | 1 | F | CR for updating applicability rule for SDR CA tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4452 | 1 | B | CR for further updating IRC tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4453 | 1 | B | CR for introducing applicability rule for 256QAM and higher layer tests for 4Rx CA | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4454 | 1 | B | CR for introducing 256QAM tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171268 | 4455 | 1 | B | CR for introducing high layers tests for 4Rx CA in Rel-14 | 14.4.0 |
| 06/2017 | RP-76 | RP-171277 | 4457 |  | F | Correction CR on 2UL CA for CA\_2A-66A | 14.4.0 |
| 06/2017 | RP-76 | RP-171277 | 4458 |  | B | Introduction of completed R14 2DL2UL band combinations to TS 36.101 | 14.4.0 |
| 06/2017 | RP-76 | RP-171299 | 4460 |  | F | Channel Raster For Multiple Standalone NB-IoT Carriers (TS 36.101) | 14.4.0 |
| 06/2017 | RP-76 | RP-171276 | 4461 |  | B | 5DL UE CR | 14.4.0 |
| 06/2017 | RP-76 | RP-171287 | 4462 |  | B | CA bandwidth class Class B 256-QAM non-contigous resource allocation MPR | 14.4.0 |
| 06/2017 | RP-76 | RP-171280 | 4463 |  | F | Corrections to CA configurations and bandwidth combination sets | 14.4.0 |
| 06/2017 | RP-76 | RP-171300 | 4464 |  | F | NB1/NB2 OOB note 3 correction | 14.4.0 |
| 06/2017 | RP-76 | RP-171285 | 4465 | 1 | F | Removing notes in two tables in UE spec wrt applicability of UL and DL requirements for band 46 | 14.4.0 |
| 06/2017 | RP-76 | RP-171311 | 4467 |  | A | Correction on TDD-FDD CSI test cases (R14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171257 | 4468 | 1 | F | Clean up the requirements for UE enhancement in SFN scenario | 14.4.0 |
| 06/2017 | RP-76 | RP-171256 | 4469 | 1 | B | CR for V2V FRCs | 14.4.0 |
| 06/2017 | RP-76 | RP-171256 | 4470 | 1 | B | CR for V2V resource pool configuration | 14.4.0 |
| 06/2017 | RP-76 | RP-171297 | 4473 |  | A | Corrections for inCoverage configuration in ProSe direct communication (Rel-14) | 14.4.0 |
| 06/2017 | RP-76 | RP-171299 | 4475 |  | A | CR for NB-IoT Absolute power tolerance | 14.4.0 |
| 06/2017 | RP-76 | RP-171307 | 4477 | 1 | B | Introduce LBT model for multile LAA Scell(s) in LAA demodualtion | 14.4.0 |
| 06/2017 | RP-76 | RP-171395 | 4482 |  | F | Missing entries in list of intra-band CA bands | 14.4.0 |
| 06/2017 | RP-76 | RP-171289 | 4483 |  | F | Correction to NS\_27 A-MPR table | 14.4.0 |
| 06/2017 | RP-76 | RP-171307 | 4484 | 1 | F | Update of LAA REFSENS exclusion region | 14.4.0 |
| 06/2017 | RP-76 | RP-171266 | 4485 | 2 | B | CR for CAT-M2 REFSENS, MPR and adding note for protection band 5 | 14.4.0 |
| 09/2017 | RP-77 | RP-171940 | 4487 | 1 | F | Corrections on Rel-14 CA requirements | 14.5.0 |
| 09/2017 | RP-77 | RP-171708 | 4490 | 1 | F | CR for adding missing table for TDD 4 DL CQI CA tests in Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4495 | 1 | F | CR for correcting TDD-FDD CA TM9 IRC tests for 4Rx CA in Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4497 |  | F | CR for updating applicability rule of 4Rx CA in Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4498 | 2 | F | CR for further updating IRC TM9 SINR requirements for 4Rx CA in Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4499 | 1 | B | CR for introducing 256QAM SNR requirements for 4Rx CA in Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4500 | 1 | B | CR for introducing 3 and 4 layers SNR requirements for 4Rx CA in Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171932 | 4501 | 1 | B | CR for introduction of PMCH and PDSCH demodulation tests for FeMBMS | 14.5.0 |
| 09/2017 | RP-77 | RP-171941 | 4502 |  | F | Corrections of Notes on REFSENS exception in 3DL/1UL of 1A-11A-28A and 3A-11-28A | 14.5.0 |
| 09/2017 | RP-77 | RP-171941 | 4503 |  | F | Modification of REFSENS exception in 4DL/1UL of 1A-3A-8A-11A | 14.5.0 |
| 09/2017 | RP-77 | RP-171973 | 4505 | 1 | F | Addition of OCNG Pattern for LAA Rx tests | 14.5.0 |
| 09/2017 | RP-77 | RP-171940 | 4508 | 1 | F | CR to 36.101 with corrections of newly introduced CA combinations | 14.5.0 |
| 09/2017 | RP-77 | RP-171971 | 4510 |  | A | PDSCH Demodulation downlink power allocation parameters for UEs supporting coverage enhancement. This CR was NOT implemented as it didn't use revison marks and the cover sheet information was wrong. | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4514 |  | A | Correction to Test Parameters for MPDCCH in Table 8.11.2.1-1 | 14.5.0 |
| 09/2017 | RP-77 | RP-171965 | 4515 | 2 | A | Correction of band 43 spurious emissions limit (Rel-14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171942 | 4520 |  | F | eHST RF: Further clarifications to HST-SFN scenario model (Rel-14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171941 | 4522 | 2 | F | Correction to B26 Cat 0 REFSENS | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4523 | 1 | B | CR on Enhanced CRS-IM PDSCH performance requirements | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4524 |  | B | CR on Enhanced CRS-IM PDSCH FRCs | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4525 | 2 | B | CR on Enhanced CRS-IM PDCCH/PCFICH performance requirements | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4526 | 1 | B | CR on Enhanced CRS-IM PDSCH requirements applicability rules | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4527 | 1 | B | CR on Enhanced CRS-IM DL control channels requirements applicability rules | 14.5.0 |
| 09/2017 | RP-77 | RP-171943 | 4532 | 1 | F | Correction on the resource pool configuration for V2V demodulation tests | 14.5.0 |
| 09/2017 | RP-77 | RP-171935 | 4533 | 1 | B | CR for V2X resource pool configuration | 14.5.0 |
| 09/2017 | RP-77 | RP-171941 | 4537 | 1 | F | Minor corrections to B70 specifications | 14.5.0 |
| 09/2017 | RP-77 | RP-171947 | 4539 |  | A | Band 68 modification to enable operation in Europe | 14.5.0 |
| 09/2017 | RP-77 | RP-171967 | 4544 | 1 | A | Band 31 modification to add DTV protection Rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171940 | 4547 | 1 | F | Corrections to Rel-14 CA configurations | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4549 |  | A | Correction to demodulation requirements for coverage enhancement UEs | 14.5.0 |
| 09/2017 | RP-77 | RP-171972 | 4551 | 1 | A | Correction to ON/OFF time mask for NB-IoT | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4553 |  | A | Correction of UE-selected subband CQI test for eMTC | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4555 |  | A | Correction of RMC for Cat-M1 TDD PDSCH demodulation requirements | 14.5.0 |
| 09/2017 | RP-77 | RP-171969 | 4557 | 1 | A | Addition of scheduling pattern with repetition for Cat-M1 UL FRC | 14.5.0 |
| 09/2017 | RP-77 | RP-171969 | 4559 |  | A | Correction of missing reference to Cat-M1 DL FRC tables | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4560 |  | B | CR for test applicability rule for 4 Rx CA tests | 14.5.0 |
| 09/2017 | RP-77 | RP-171940 | 4561 |  | F | CR for correcting FRC for Cat.1 bis demodulation test | 14.5.0 |
| 09/2017 | RP-77 | RP-171940 | 4564 |  | F | Correction CR on 5DL CA for CA\_1A-3A-7A-7A-26A | 14.5.0 |
| 09/2017 | RP-77 | RP-171941 | 4566 |  | F | 4Rx spec correction CR for 36.101 | 14.5.0 |
| 09/2017 | RP-77 | RP-171942 | 4568 |  | F | Maintenance of performance requirements for MUST | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4569 |  | B | CR for test applicability rule for enhanced SU-MIMO | 14.5.0 |
| 09/2017 | RP-77 | RP-171935 | 4570 | 1 | B | CR for V2X sidelink FRC | 14.5.0 |
| 09/2017 | RP-77 | RP-171943 | 4572 | 1 | F | Some corrections on V2X in TS 36.101 | 14.5.0 |
| 09/2017 | RP-77 | RP-171943 | 4578 | 1 | F | CR on V2X duplexer mode in rel-14 | 14.5.0 |
| 09/2017 | RP-77 | RP-171942 | 4582 | 1 | B | CR for CAT-M2 FRC | 14.5.0 |
| 09/2017 | RP-77 | RP-171942 | 4583 | 1 | F | CR for CAT-M2 REFSENS for FDD/TDD | 14.5.0 |
| 09/2017 | RP-77 | RP-171943 | 4586 | 1 | F | CR for V2V performance requirements (maintenance) | 14.5.0 |
| 09/2017 | RP-77 | RP-171935 | 4587 | 1 | B | CR for V2X test cases | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4588 | 1 | B | CR for enhanced SU-MIMO performance requirements | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4589 | 1 | B | CR for enhanced SU-MIMO FRCs | 14.5.0 |
| 09/2017 | RP-77 | RP-171939 | 4590 |  | B | CR for MIMO correlation matrices | 14.5.0 |
| 09/2017 | RP-77 | RP-171964 | 4597 |  | A | Correction for EPA delay profiles of r.m.s delay spread (Rel-14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171942 | 4599 |  | F | Maintenance CR for channel model for HST-SFN scenario | 14.5.0 |
| 09/2017 | RP-77 | RP-171942 | 4600 |  | F | Maintenance CR for FRC for HST-SFN scenario | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4602 |  | A | CR for requirements of Cat-1bis and Cat-0(R14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4604 |  | A | CR for requirements of MPDCCH with 2Rx and 4Rx(R14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4606 |  | A | CR for requirements of TM2 with 2Rx and 4Rx(R14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4610 |  | A | CR for requirements of TM9 with 2Rx and 4Rx(R14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171970 | 4612 |  | A | Correction to FRC Table A.3.4.2.1-7 for eMTC (R14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171937 | 4613 | 1 | B | CR for NB-IoT enhancements | 14.5.0 |
| 09/2017 | RP-77 | RP-171972 | 4615 |  | A | CR for R13 NB-IoT performance requirements maintenances (R14) | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4620 |  | F | Addition of new Rel-14 CA 3DL CC test cases for 4Rx CA | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4625 |  | F | Addition of new Rel-14 CA 4DL CC test cases for 4Rx CA | 14.5.0 |
| 09/2017 | RP-77 | RP-171938 | 4630 |  | F | Addition of new Rel-14 CA 5DL CC test cases for 4Rx CA | 14.5.0 |
| 09/2017 | RP-77 | RP-171965 | 4634 |  | A | Apply CA demodulation performance requirements with 30us timing difference between two CCs to intra-band non-contiguous CA case | 14.5.0 |
| 09/2017 | RP-77 | RP-171966 | 4639 |  | A | Update to CA\_NS\_04 SEM and additional spurious emissions | 14.5.0 |
| 09/2017 | RP-77 | RP-171969 | 4648 |  | A | CR for Remove bracket for NS\_07 in A-MPR requirement for CAT-M1 | 14.5.0 |
| 09/2017 | RP-77 | RP-171943 | 4649 |  | F | CR on band definition for sidelink operation in band 47 | 14.5.0 |
| 09/2017 | RP-77 | RP-171955 | 4506 | 1 | B | Introduction of Rel-15 LTE Intra-band combinations in 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171958 | 4507 |  | B | Introduction of additional band combinations for 4DL CA | 15.0.0 |
| 09/2017 | RP-77 | RP-171948 | 4536 |  | B | Introduction of the FDD L-band (Band 74) into TS 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171946 | 4541 | 1 | B | Introduction of Band 72 into TS 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171959 | 4545 |  | B | 5DL/1UL CR to TS 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171962 | 4565 |  | B | Big CR for introduction new band support for 4Rx antenna ports R15 for LTE | 15.0.0 |
| 09/2017 | RP-77 | RP-171957 | 4567 |  | B | Introduction of completed R15 3DL band combinations to TS 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171956 | 4571 | 3 | B | Introduction of completed combination to 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171960 | 4573 | 1 | B | Introduction of completed R15 2DL/2UL band combinations to TS 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171951 | 4574 |  | B | Introduction of power class 1 HPUE in Band 3, 20 and 28 | 15.0.0 |
| 09/2017 | RP-77 | RP-171961 | 4576 |  | B | Introduction of additional 3DL/2UL CA band combinations w/o self-interference issues in Rel-15 | 15.0.0 |
| 09/2017 | RP-77 | RP-171961 | 4577 | 1 | B | Introduction of additional 4DL/2UL CA band combinations w/o self-interference issues in Rel-15 | 15.0.0 |
| 09/2017 | RP-77 | RP-171963 | 4579 |  | B | Addition of band 28 and 40 to LTE MTC Cat.0 | 15.0.0 |
| 09/2017 | RP-77 | RP-171953 | 4581 |  | B | Introduction of V2X new band combinations in Rel-15 | 15.0.0 |
| 09/2017 | RP-77 | RP-171949 | 4598 | 1 | B | Introduction of TDD L-band TS 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171952 | 4635 | 2 | B | Introduction of Band 71 to 36.101 | 15.0.0 |
| 09/2017 | RP-77 | RP-171950 | 4640 | 1 | B | Introduction of Extended 1.5 GHz SDL bands 75 and 76 | 15.0.0 |
| 09/2017 | RP-77 | RP-172047 | 4650 |  | B | Additional LTE bands for UE category M1, NB1, M2, NB2 in Rel-15 | 15.0.0 |
| 12/2017 | RP-78 | RP-172574 | 4654 |  | A | Correction to Test Parameters for Cat M1 PUCCH 1-0 static test | 15.1.0 |
| 12/2017 | RP-78 | RP-172607 | 4657 |  | A | Correction of the reference channel for the LAA CSI test | 15.1.0 |
| 12/2017 | RP-78 | RP-172590 | 4658 |  | B | Introduction of completed R15 2DL/2UL band combinations to TS 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172611 | 4661 |  | A | CR for NB-IoT Transmit Intermodulation | 15.1.0 |
| 12/2017 | RP-78 | RP-172610 | 4667 | 1 | A | Corrections to NPDCCH configuration in NPDSCH test case | 15.1.0 |
| 12/2017 | RP-78 | RP-172613 | 4676 | 1 | A | Updates to performance requirements in 8.3.1.1 and 8.3.2.1A | 15.1.0 |
| 12/2017 | RP-78 | RP-172584 | 4678 |  | A | Maintenance CR for V2V (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172585 | 4680 |  | A | Maintenance CR for V2X (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4682 |  | A | Maintenances CR for eSU-MIMO (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172608 | 4685 | 1 | A | CR for MPDCCH with 2Rx/4Rx (R15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172608 | 4688 | 1 | A | CR forTM2/TM9 with 2Rx/4Rx (R15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172608 | 4691 |  | A | CR on redundancy version for BL/CE UEs (R15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172586 | 4700 |  | A | CR on reflection of FCC regulation for vehicle mounted UE at Band 30 in rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172608 | 4704 |  | A | Applicability of CQI test for coverage enhancement for non-BL CE UE (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172583 | 4706 |  | A | Introduction of DL FRC for FeMTC RF test (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172579 | 4708 | 1 | A | Introduction of UE demodulation and CQI requirements for FeMTC (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172584 | 4714 |  | A | CR on correction of V2V Test requirement for power imbalance test | 15.1.0 |
| 12/2017 | RP-78 | RP-172581 | 4717 | 1 | A | CR for updating TDD CQI CA tests in Rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4720 | 1 | A | CR for updating overview table for 4Rx RMC in Rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4722 | 1 | A | CR for removing square bracket for 4Rx CA tests in Rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172593 | 4728 |  | B | Introduction of Band 73 into TS 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4732 |  | A | Corrections to CA\_29A-66C, CA\_29A-70A and CA\_29A-66A-66A | 15.1.0 |
| 12/2017 | RP-78 | RP-172597 | 4733 |  | F | Corrections to B29 CA related specifications | 15.1.0 |
| 12/2017 | RP-78 | RP-172572 | 4734 |  | B | ProSe support for Band 72 | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4737 |  | A | Correction to supported bandwidths for CA configurations with Band 30 | 15.1.0 |
| 12/2017 | RP-78 | RP-172580 | 4740 |  | A | NPDSCH demodulation test parameter and minimum requirement for CatNB2 UE Rel.15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172581 | 4741 |  | A | Correction of MPR for CA BW Class D | 15.1.0 |
| 12/2017 | RP-78 | RP-172603 | 4744 | 1 | F | Adding missing UE co-existence requirements for B71 | 15.1.0 |
| 12/2017 | RP-78 | RP-172596 | 4745 |  | B | CR for 36101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172586 | 4747 |  | A | CR for EIRP based requirements in V2X | 15.1.0 |
| 12/2017 | RP-78 | RP-172586 | 4749 | 1 | A | CR for CEN DSRC and HDR DSRC coex requirement for V2X | 15.1.0 |
| 12/2017 | RP-78 | RP-172573 | 4751 |  | A | Draft CR for introduction of eFD-MIMO PMI test cases | 15.1.0 |
| 12/2017 | RP-78 | RP-172573 | 4753 |  | A | CR for introducing eFD-MIMO demodulation performance requirements | 15.1.0 |
| 12/2017 | RP-78 | RP-172573 | 4755 |  | A | Draft CR for introduction of eFD-MIMO Hybrid CSI test cases | 15.1.0 |
| 12/2017 | RP-78 | RP-172573 | 4757 |  | A | CR for introducing FRC for eFD-MIMO performance requirements test cases | 15.1.0 |
| 12/2017 | RP-78 | RP-172612 | 4760 | 1 | A | Correction CR for FD-MIMO performance requirements (R15 CAT A) | 15.1.0 |
| 12/2017 | RP-78 | RP-172610 | 4763 |  | A | Correction to NPDCCH configuration in demodulation test case | 15.1.0 |
| 12/2017 | RP-78 | RP-172585 | 4765 |  | A | CR on SNR values modification for V2X demodulation test cases (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172583 | 4767 |  | A | CR for introducing B1 Cat.M2 UE A-MPR in Japan into 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172595 | 4768 |  | B | Introduction of additional band combinations for Intra-band CA | 15.1.0 |
| 12/2017 | RP-78 | RP-172704 | 4769 |  | B | Introduction of Rel-15 LTE 4DL/1UL combinations in 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172586 | 4772 |  | A | Correction of channel spacing for band 46 intraband CA band combinations with 10 MHz bandwidth | 15.1.0 |
| 12/2017 | RP-78 | RP-172598 | 4773 |  | B | Introduction of 5DL CA combinations to 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172611 | 4777 | 1 | A | NB-IoT removal of repetition sensitivity requriement Rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172601 | 4778 |  | F | Correction to band 72 | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4780 |  | F | Correction of CR Implementation error to 36.101 (REL-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172594 | 4781 | 3 | B | Introduction of Band 49 | 15.1.0 |
| 12/2017 | RP-78 | RP-172602 | 4782 | 2 | F | CR to 36.101: corrections for HPUE requirements | 15.1.0 |
| 12/2017 | RP-78 | RP-172585 | 4784 | 1 | A | Correction on V2X resource pool configuration | 15.1.0 |
| 12/2017 | RP-78 | RP-172587 | 4785 | 2 | B | Add sTTI support to 6.3.4 ON/OFF Mask section | 15.1.0 |
| 12/2017 | RP-78 | RP-172587 | 4786 | 2 | B | Add sTTI support to sub-clauses related to Max output power, MPR, A-MPR and min output power of 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172587 | 4787 | 4 | B | Add sTTI support to remaining sub-clauses of 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172612 | 4793 |  | A | CSI 4RX: Correction to RI tests and used reference channels and MCS schemes (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172607 | 4796 |  | A | Correction of FRC for Cat-M1 UE maximum input level test (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172581 | 4799 |  | A | Corrections to FeMBMS demodulation test FRC rel.15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172590 | 4802 |  | B | Introduction of completed R15 2DL/2UL band combinations to TS 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172610 | 4804 |  | A | CR for NB-IoT Additional Spectrum Emission Mask | 15.1.0 |
| 12/2017 | RP-78 | RP-172606 | 4808 | 2 | A | Corrections on operating band table for CA (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172591 | 4810 |  | B | Introduction of new xDL/2UL CA band combinations in Rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172581 | 4811 | 2 | A | Corrections on inter-band CA operating bands (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172612 | 4814 | 2 | A | Corrections on the description of requirements for inter-band CA (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172592 | 4815 | 1 | B | Introduction of power class 2 HPUE in Band 38 | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4819 |  | A | CR for further updating SDR 4Rx tests in Rel-15 | 15.1.0 |
| 12/2017 | RP-78 | RP-172597 | 4820 |  | B | Introduction of completed R15 3DL band combinations to TS 36.101 | 15.1.0 |
| 12/2017 | RP-78 | RP-172598 | 4821 |  | F | Correction to Uplink configurations for CA\_5DL\_1A-1A-3C-7A\_1UL\_BCS0, CA\_5DL\_1A-3C-7A-8A\_1UL\_BCS0 and max aggregation bandwidth for CA\_1A-3C-7A-20A | 15.1.0 |
| 12/2017 | RP-78 | RP-172585 | 4823 |  | A | CR for updating overview table for V2X (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172606 | 4827 |  | A | CR for updating overview table for Sidelink (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172584 | 4829 |  | A | Corrections to UL 256QAM RMCs | 15.1.0 |
| 12/2017 | RP-78 | RP-172612 | 4832 |  | A | Addition of beamforming model to chapter 9 4Rx TM9 requirements | 15.1.0 |
| 12/2017 | RP-78 | RP-172582 | 4837 | 2 | A | Correction to Rel-15 CA configurations | 15.1.0 |
| 12/2017 | RP-78 | RP-172581 | 4839 | 1 | A | Correction to section 8.11.1.2.3 | 15.1.0 |
| 12/2017 | RP-78 | RP-172597 | 4840 |  | F | Correction to Rel-15 CA configurations | 15.1.0 |
| 12/2017 | RP-78 | RP-172587 | 4841 | 2 | B | PCMAC for single carrier in Rel-15 sTTI operation | 15.1.0 |
| 12/2017 | RP-78 | RP-172587 | 4842 | 2 | B | PCMAC for UL CA in Rel-15 sTTI operation | 15.1.0 |
| 12/2017 | RP-78 | RP-172581 | 4844 |  | A | Addition of new 3DL CCs related test cases (Rel-15) | 15.1.0 |
| 12/2017 | RP-78 | RP-172586 | 4851 |  | A | CR on Uplink and sidelink configure for REFSENSE table | 15.1.0 |
| 12/2017 | RP-78 | RP-172589 | 4852 |  | B | Introduction of PC2 for CA\_41C | 15.1.0 |
| 12/2017 | RP-78 | RP-172605 | 4857 |  | A | Update to A-MPR for CA\_NS\_04 | 15.1.0 |
| 12/2017 | RP-78 | RP-172586 | 4859 |  | A | Correction of IMD Exclusion zone BW caused by dual uplink CA with band 46 | 15.1.0 |
| 12/2017 | RP-78 | RP-172549 | 4860 |  | B | Introduction of missing 3DL fallbacks to 4DL combinations | 15.1.0 |
| 2018-03 | RAN#79 | RP-180265 | 4862 | 1 | B | CR on UE RF requirments for DL 1024QAM in TS 36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180296 | 4864 |  | A | Update EVM requirements for V2X | 15.2.0 |
| 2018-03 | RAN#79 | RP-180296 | 4866 |  | A | CR on IBE requirements for intra-band contiguous multiple carriers | 15.2.0 |
| 2018-03 | RAN#79 | RP-180266 | 4867 | 1 | F | CR for TS 36.101: Removal UE requirements for shared spectrum channel access | 15.2.0 |
| 2018-03 | RAN#79 | RP-180277 | 4868 | 1 | B | Introduction of power class 2 HPUE in Band 40 and 42 to TS 36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180275 | 4870 |  | B | Introduction of additional xDL/2UL CA band combinations in rel-15 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180298 | 4872 |  | A | Correction to Test Parameters for Cat M1 PUCCH 1-0 static test | 15.2.0 |
| 2018-03 | RAN#79 | RP-180292 | 4875 |  | A | Correction to UE-selected subband CQI test for eMTC | 15.2.0 |
| 2018-03 | RAN#79 | RP-180296 | 4877 |  | A | CR for removing square bracket for V2X eNB sync test (Rel-15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180295 | 4879 |  | A | Correction on FRC for 4Rx CA tests (Rel-15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180292 | 4883 |  | A | Maintennace CR for R13 Non-BL/UE requirements (R15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180292 | 4885 |  | A | PDSCH Demodulation downlink power allocation parameters for UEs supporting coverage enhancement | 15.2.0 |
| 2018-03 | RAN#79 | RP-180295 | 4888 |  | A | Correction to DL power allocation of CSI reporting for 4Rx UE in 9.9.4.1 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180291 | 4891 |  | A | Corrections to LAA CQI reporting requirements | 15.2.0 |
| 2018-03 | RAN#79 | RP-180291 | 4894 |  | A | Addition of two sided OCNG pattern for FS3 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180276 | 4898 |  | B | Introduction of UL CA\_41C-42C into TS36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180297 | 4903 |  | A | Correction of A-MPR table for UE Cat.M2 of Band 1 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180294 | 4908 |  | A | Correction on Test Parameters for FRC for CA more than 3DL CA | 15.2.0 |
| 2018-03 | RAN#79 | RP-180272 | 4909 |  | B | Introduction of completed R15 3DL/1UL band combinations to TS 36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180269 | 4910 | 2 | B | CR on UE RF requirement for 8Rx | 15.2.0 |
| 2018-03 | RAN#79 | RP-180270 | 4911 |  | B | Introduction of additional band combinations for Intra-band CA | 15.2.0 |
| 2018-03 | RAN#79 | RP-180273 | 4912 |  | B | Introduction of Rel-15 LTE 4DL/1UL combinations in 36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180290 | 4921 |  | A | Correction for CA CQI tests (R15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180268 | 4922 | 2 | B | CR for enhanced PDCCH demodulation performance for category 1bis UE with CRS-IM | 15.2.0 |
| 2018-03 | RAN#79 | RP-180284 | 4923 | 1 | F | Correction of a target band for FDD class 1 HP-UE | 15.2.0 |
| 2018-03 | RAN#79 | RP-180294 | 4926 | 1 | A | Corrections to Spurious emission band UE co-existence for CA | 15.2.0 |
| 2018-03 | RAN#79 | RP-180295 | 4928 |  | A | Correction CR for Semi-OL rank1 test (CAT A) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180279 | 4929 | 1 | B | CR to 36.101: Introduction of Band 85 (B12-extended) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180285 | 4932 |  | A | PC2 for CA\_41C REL-15 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180286 | 4933 | 1 | F | Correction of band 72 MOP | 15.2.0 |
| 2018-03 | RAN#79 | RP-180283 | 4936 | 1 | F | Correction to UL-MIMO MOP Table Rel-15 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180271 | 4937 |  | F | MSD for CA\_2A-71A | 15.2.0 |
| 2018-03 | RAN#79 | RP-180271 | 4938 | 1 | F | Introduction of CA band combination basis Delta TIB,c table | 15.2.0 |
| 2018-03 | RAN#79 | RP-180271 | 4939 | 1 | F | Introduction of CA band combination basis Delta RIB,c table | 15.2.0 |
| 2018-03 | RAN#79 | RP-180298 | 4941 |  | A | Clean up of PDSCH demodulation requirements for FeMTC | 15.2.0 |
| 2018-03 | RAN#79 | RP-180290 | 4948 |  | A | Adding note about timing difference for TDD CA (2Rx) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180299 | 4950 |  | A | Adding note about timing difference for TDD CA and TDD FDD CA (4Rx) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180292 | 4953 |  | A | CR to 36.101: Introduction of A-MPR table for NS4 and NS12 for CAT-M1 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180294 | 4956 |  | A | CSI 4RX: Correction to reference channels and MCS schemes used in RI tests (Rel-15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180286 | 4957 |  | F | Correction to Band 72 ProSe frequencies | 15.2.0 |
| 2018-03 | RAN#79 | RP-180271 | 4959 |  | B | CR for 36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180295 | 4961 |  | A | CR on Enhanced CRS-IM test case applicability (Rel-15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180299 | 4963 |  | A | CR on definition of 4x1 MIMO correlation matrices (Rel-15) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180299 | 4965 |  | A | CR to TS 36.101: Correction of CA table 7.3.1A-0bD R15 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180299 | 4967 |  | A | CR to TS 36.101: Correction of CA table 7.3.1A-6 R15 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180278 | 4969 | 1 | B | Introduction of TDD 3.3-3.4GHz band (band 52) | 15.2.0 |
| 2018-03 | RAN#79 | RP-180274 | 4970 |  | B | Introduction of 5DL CA combinations to 36.101 | 15.2.0 |
| 2018-03 | RAN#79 | RP-180292 | 4973 |  | A | Correction of MPDCCH performance requirements | 15.2.0 |
| 2018-06 | RAN#80 | RP-181086 | 4974 | 1 | B | Enhanced PDCCH demodulation performance for category 1bis UE with CRS-IM TDD | 15.3.0 |
| 2018-06 | RAN#80 | RP-181115 | 4980 |  | A | CR on absolute power tolerance for V2X | 15.3.0 |
| 2018-06 | RAN#80 | RP-181104 | 4982 | 1 | F | CR on UE-to-UE coexistence requirements for LTE band 71 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181092 | 4985 |  | B | Introduction of 5DL CA combinations to 36.101  (This CR was superseded by CR#5096) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 4986 | 1 | F | Corrections to B66+B70+B71 related Inter-band CA combinations | 15.3.0 |
| 2018-06 | RAN#80 | RP-181097 | 4987 |  | B | TS 36.101 big CR for introduction new band support for 4Rx antenna ports R15 for LTE | 15.3.0 |
| 2018-06 | RAN#80 | RP-181108 | 4992 |  | A | CA\_NS\_08 correction for TS 36.101 R15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181087 | 4993 | 1 | B | CR for 36.101: 8Rx CA RF requirement | 15.3.0 |
| 2018-06 | RAN#80 | RP-181086 | 4994 | 1 | B | CR on 1RX CRS-IM PDSCH Cat1bis performance requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181086 | 4995 | 1 | B | CR on 1RX CRS-IM PDSCH CatM2 performance requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181086 | 4996 | 1 | B | CR on 1RX CRS-IM MPDCCH CatM2 performance requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181086 | 4997 |  | B | CR on 1RX CRS-IM test case applicability | 15.3.0 |
| 2018-06 | RAN#80 | RP-181078 | 4998 | 1 | B | CR on FeCoMP UE PDSCH demodulation requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181114 | 5000 |  | A | CR on Enhanced 4RX SU-MIMO test cases correction (Rel-15) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181112 | 5003 |  | A | Clarifcation on TX-RX frequency separation for stand-alone NB-IoT operation | 15.3.0 |
| 2018-06 | RAN#80 | RP-181114 | 5005 | 1 | A | Addition of UL RMC for eLAA R15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181108 | 5009 |  | A | Clarification of Transmission Modes for REFSEN test R15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181108 | 5013 |  | A | Correction for CA CQI tests (R15) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181105 | 5021 |  | F | Cat.F CR for UE-to-UE co-existence for Band 3 in Japan (Rel-15) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181077 | 5025 | 1 | F | Clarification on sTTI applicability and wording fixes | 15.3.0 |
| 2018-06 | RAN#80 | RP-181098 | 5026 |  | F | CR to 36.101: Removed note for B42 PC2 from UE power class Table | 15.3.0 |
| 2018-06 | RAN#80 | RP-181115 | 5028 |  | A | Correction to RMC for UL 256QAM | 15.3.0 |
| 2018-06 | RAN#80 | RP-181111 | 5031 |  | A | Update to eMTC demod requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181091 | 5035 |  | B | Introduction of Rel-15 LTE 4DL/1UL combinations in 36.101  (This CR was superseded by CR#5098) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181103 | 5036 |  | F | Correction of UE co-existence from bands 12/17 into band 51 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181111 | 5039 |  | A | Correction of UE co-existence from band 28 into band 66 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181111 | 5041 |  | A | Correction of UE co-existence from band 28 into band 66 (CA part 1) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181111 | 5042 |  | F | Correction of UE co-existence from band 28 into band 66 (CA part 2) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181093 | 5043 |  | B | Introduction of more than 5DL CA combinations to 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181081 | 5044 | 2 | B | CR ON\_OFF mask for feLAA | 15.3.0 |
| 2018-06 | RAN#80 | RP-181083 | 5045 | 1 | B | MPR for PC6 CAT-M1 and CAT-M2 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181106 | 5051 |  | A | CR: Corrections for CSI tests (Rel-15) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181108 | 5054 |  | A | Correction to uplink configuration for CA\_25A-41C | 15.3.0 |
| 2018-06 | RAN#80 | RP-181089 | 5055 |  | B | CR to add new 2DL1UL CA combos to 36101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181090 | 5056 |  | B | Introduction of Rel-15 LTE 3DL/1UL combinations in 36.101  (This CR was superseded by CR#5109) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 5057 |  | F | Improvement of REFSENS exceptions due to harmonic issue | 15.3.0 |
| 2018-06 | RAN#80 | RP-181095 | 5058 |  | B | Introduction of 3UL CA into TS36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 5059 |  | F | Improvement of REFSENS exceptions for due to close proximity of UL to DL channel | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 5060 |  | F | Improvement of REFSENS exceptions due to harmonic issues in mixed intra and inter-band CA | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 5061 |  | F | Improvement of REFSENS exceptions due to cross band isolation issues | 15.3.0 |
| 2018-06 | RAN#80 | RP-181113 | 5064 |  | A | Correction to DL power allocation of CSI reporting for 4Rx UE in 9.9.4.2 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181110 | 5067 |  | A | Correction to CQI reporting definition on PUSCH static test | 15.3.0 |
| 2018-06 | RAN#80 | RP-181094 | 5070 |  | F | CR to add note 19 to CA\_26A-41A and CA\_5A-41A in harmonic table | 15.3.0 |
| 2018-06 | RAN#80 | RP-181078 | 5072 | 1 | B | CR on FeCoMP UE CSI reporting requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181089 | 5073 | 1 | F | CR to correct Note 18 in table 7.3.1A-0bE in rel 15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181089 | 5074 | 1 | B | CR for 36101 to update 2DL1UL CA basket items | 15.3.0 |
| 2018-06 | RAN#80 | RP-181116 | 5077 |  | A | Correction to Rel-14 CA configurations | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 5078 |  | F | Addition of Band 72 and 73 to chapter 8 and 9 general clauses | 15.3.0 |
| 2018-06 | RAN#80 | RP-181110 | 5081 |  | A | Correction to LAA RMC (Rel-14) | 15.3.0 |
| 2018-06 | RAN#80 | RP-181110 | 5084 |  | A | Update to chapter 8 LAA requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181091 | 5085 |  | F | Corrections to Rel-15 CA configurations | 15.3.0 |
| 2018-06 | RAN#80 | RP-181094 | 5086 |  | B | Introduction of additional xDL/2UL CA band combinations in rel-15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181096 | 5087 |  | B | CR on introduction of new V2X band combinations in rel-15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181084 | 5088 | 2 | B | NB-IoT: Adding TDD support in TS 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181115 | 5091 |  | A | Removal of square brackets from eNB-IoT UE demodulation requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181093 | 5092 |  | B | Introduction of more than 5DL CA combinations to 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181111 | 5095 |  | A | Correction to eMTC subband CQI test R15 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181092 | 5096 |  | B | Introduction of 5DL CA combinations to 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181091 | 5098 |  | B | Introduction of Rel-15 LTE 4DL/1UL combinations in 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181104 | 5099 | 1 | F | Adding missing spurious emission UE co-existence requirement for B70 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181079 | 5102 | 1 | B | CR on introduction of Tx Diversity scenario for eV2X in TS 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181079 | 5103 |  | B | CR on introduction of sidelink 64QAM in TS 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181079 | 5104 |  | B | CR on introduction of new eV2X scenarios in TS 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181116 | 5107 |  | A | CR to add norminal guard band for CA bandwidth class F | 15.3.0 |
| 2018-06 | RAN#80 | RP-181083 | 5108 | 1 | B | CR\_UE RF requirement on subPRB feature | 15.3.0 |
| 2018-06 | RAN#80 | RP-181090 | 5109 |  | B | Introduction of completed R15 3DL/1UL band combinations to TS 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181107 | 5114 |  | A | Update to CA\_NS\_04 requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181108 | 5118 |  | A | Update to NS\_04 requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181116 | 5120 |  | A | Update to NS\_27 requirements | 15.3.0 |
| 2018-06 | RAN#80 | RP-181092 | 5124 |  | F | Missing channel bandwidths and editorial corrections | 15.3.0 |
| 2018-06 | RAN#80 | RP-181101 | 5125 | 2 | B | Introduction of power class 1 HPUE in Band 31 and 72 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181100 | 5128 | 2 | F | CR on Correction on Band 74 requirement on protecting EESS | 15.3.0 |
| 2018-06 | RAN#80 | RP-181088 | 5129 |  | B | Introduction of Rel-15 LTE Intra-band combinations in 36.101 | 15.3.0 |
| 2018-06 | RAN#80 | RP-181115 | 5130 |  | A | CR on A-SE, A-SEM and A-MPR for V2X Service in Band 47 | 15.3.0 |
| 2018-09 | RAN#81 | RP-181899 | 5169 | 1 | B | CR\_UE RF requirement on low output power | 15.4.0 |
| 2018-09 | RAN#81 | RP-181899 | 5170 | 1 | B | CR\_UE RF requirement on subPRB feature | 15.4.0 |
| 2018-09 | RAN#81 | RP-181902 | 5164 |  | F | CR on UE category for DL 1024QAM in TS 36.101 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181902 | 5141 | 2 | B | CR: test case for reduced DMRS | 15.4.0 |
| 2018-09 | RAN#81 | RP-181903 | 5167 |  | F | CR on V2X reference measurement channel for R15 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181908 | 5190 | 1 | A | Correction on Table 7.3.1-3 Network signalling value for reference sensitivity | 15.4.0 |
| 2018-09 | RAN#81 | RP-181909 | 5159 |  | A | Mirror CR Rel-15 towards TS 36.101 to remove square brackets for CA\_4A-7A\_12A | 15.4.0 |
| 2018-09 | RAN#81 | RP-181909 | 5150 | 1 | F | Correction on Table 6.6.3.2A-0 Requirements for uplink inter-band carrier aggregation (two bands) | 15.4.0 |
| 2018-09 | RAN#81 | RP-181912 | 5135 |  | A | Correction of cqi-pmi-ConfigurationIndex for PUCCH 1-0 static test on multiple cells | 15.4.0 |
| 2018-09 | RAN#81 | RP-181913 | 5179 |  | A | Corrections of Rel-15 CA specs | 15.4.0 |
| 2018-09 | RAN#81 | RP-181913 | 5173 | 1 | A | CR to add CA\_1-21-42 in exception table | 15.4.0 |
| 2018-09 | RAN#81 | RP-181913 | 5163 | 1 | A | CR correction of UL CA configuration CA\_40D REFSENS requirement Rel-15 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181914 | 5138 |  | A | CR on A-SE, A-SEM and A-MPR for V2X Service in Band 47 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181914 | 5193 |  | A | CR on frame structure type for band 47 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181914 | 5168 | 1 | A | CR on V2X reference measurment channel for 64QAM | 15.4.0 |
| 2018-09 | RAN#81 | RP-181916 | 5132 |  | A | Correction on the typo in subclause 9.11.1 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181916 | 5152 | 1 | A | Correction on Table 7.3.1A-0bE | 15.4.0 |
| 2018-09 | RAN#81 | RP-181916 | 5154 | 1 | F | Correction on Table 7.3.1A-5 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181916 | 5160 | 1 | A | Rel-15 CR towards TS 36.101 to correct errors in notes | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5139 |  | F | CR on 1RX CRS-IM requirements corrections | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5140 |  | F | CR on FeCoMP requirements corrections | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5177 |  | F | Corrections of REFSENS exceptions | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5181 |  | F | Corrections to Rel-15 CA configurations | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5176 | 1 | F | Corrections of Rel-15 CA specs | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5183 | 1 | B | Introduction of missing R15 2DL2UL band combinations to TS 36.101 | 15.4.0 |
| 2018-09 | RAN#81 | RP-181917 | 5146 | 1 | F | Correction on Table 6.6.3.2-1 Spurious emission band UE co-existence | 15.4.0 |
| 2018-12 | RAN#82 | RP-182383 | 5196 |  | F | UE category M1 and M2 MPR section corrections Rel-15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5199 |  | F | Simplification of CA UE to UE co-ex table by adopting CA band approach | 15.5.0 |
| 2018-12 | RAN#82 | RP-182385 | 5204 |  | A | Correction to PDSCH CA and DC Demodulation (4 Rx Ant ports) | 15.5.0 |
| 2018-12 | RAN#82 | RP-182369 | 5206 | 1 | B | CR for eV2X FRCs and resource pool configuration | 15.5.0 |
| 2018-12 | RAN#82 | RP-182369 | 5207 |  | F | CR on RMC for sidelink 64QAM | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5210 |  | F | Correction of BCS for CA\_3A-3A-7A-20A and CA\_2A-46A-48C-66A | 15.5.0 |
| 2018-12 | RAN#82 | RP-182364 | 5214 | 3 | B | Introduction of Slot/Subslot-PDSCH demodulation requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182364 | 5215 | 3 | B | Introduction of SPDCCH demodulation requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182364 | 5216 | 3 | B | Introduction of CQI tests for sTTI | 15.5.0 |
| 2018-12 | RAN#82 | RP-182365 | 5217 | 3 | B | Introduction of UE demodulation requirements for eFeMTC | 15.5.0 |
| 2018-12 | RAN#82 | RP-182365 | 5218 | 2 | B | Introduction of CQI reporting requirements for eFeMTC | 15.5.0 |
| 2018-12 | RAN#82 | RP-182381 | 5225 | 1 | A | Correction of spurious emission band UE co-existence for NB-IoT | 15.5.0 |
| 2018-12 | RAN#82 | RP-182374 | 5227 | 2 | B | CR on introduction of 6CCs and 7CCs FDD/TDD CA demodulation performance requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182374 | 5228 | 2 | B | CR on introduction of 6CCs and 7CCs FDD-TDD CA demodulation performance requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182374 | 5229 | 2 | B | CR on introduction of 6CCs and 7CCs SDR test cases requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182383 | 5232 |  | A | Clarification of applicability for demodulation requirement for CE UE R15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182368 | 5233 |  | F | Clarification of applicability rule and test parameter for OCC4-based TM9 rank4 demodulation requirement R15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5234 | 1 | F | Correction to test parameter in 1Rx CRS-IM demodulation requirement | 15.5.0 |
| 2018-12 | RAN#82 | RP-182382 | 5239 | 1 | F | Correction of LTE UE requirements for inter-band CA - R15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182373 | 5244 |  | B | CR: Addition of propagation conditions related with 8Rx | 15.5.0 |
| 2018-12 | RAN#82 | RP-182368 | 5245 | 3 | B | CR:For 1024QAM DL demodulation requirements under fading propagation conditions | 15.5.0 |
| 2018-12 | RAN#82 | RP-182385 | 5252 |  | F | Updating the limit of the Power Spectral Density for LAA in Korea | 15.5.0 |
| 2018-12 | RAN#82 | RP-182385 | 5257 | 1 | F | Correction on REFSENS exception of CA\_3A-28A-42C for REL-15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182379 | 5261 | 1 | A | Correction to frequency of CA\_4A-7A for MSD with inter-band 2UL | 15.5.0 |
| 2018-12 | RAN#82 | RP-182362 | 5263 | 1 | B | Introduction of NR band protection in TS36.101 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182369 | 5264 |  | B | CR on eV2X UE soft buffer and SDR requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182386 | 5265 | 1 | B | CR to TS 36.101: Implementation of UL PRB to DL PRB center offset for TDD NB-IoT | 15.5.0 |
| 2018-12 | RAN#82 | RP-182369 | 5266 | 1 | B | CR for eV2X single link PSSCH tests and PSCCH decoding capability test cases | 15.5.0 |
| 2018-12 | RAN#82 | RP-182381 | 5273 |  | A | PDSCH traffic pattern in 4Rx PHICH Demodulation test - Rel-15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182379 | 5275 | 1 | A | MCG/SCG Abbreviations in TS36.101 in rel-15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182385 | 5280 |  | A | Remove the brackets in Rel-14 V2V AMPR | 15.5.0 |
| 2018-12 | RAN#82 | RP-182385 | 5285 |  | A | Corrections of REFSENS exceptions in Rel-15 Cas | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5286 | 1 | F | Misc corrections on Rel-15 CAs | 15.5.0 |
| 2018-12 | RAN#82 | RP-182366 | 5291 | 1 | A | CR MPR for NB-IoT PC6 Rel-15 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182374 | 5293 |  | B | CR on introduction of 6CCs and 7CCs LAA CA demodulation performance requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182365 | 5298 | 1 | B | CR\_UE RF requirement on subPRB feature\_cat\_M1 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182365 | 5299 |  | B | CR\_UE RF requirement on subPRB feature\_cat\_M2 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5301 |  | F | Rel-15 CR to remove NS\_04 requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182373 | 5303 | 1 | B | CR on 8Rx CA RF requirement for TS 36.101 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182372 | 5306 | 1 | B | CR for demodulation performance requirements for network-based CRS interference mitigation | 15.5.0 |
| 2018-12 | RAN#82 | RP-182373 | 5307 | 1 | B | CR: applicability and test rules for 8Rx capable UEs | 15.5.0 |
| 2018-12 | RAN#82 | RP-182373 | 5308 | 1 | B | CR: Addition of performance requirements for 8Rx | 15.5.0 |
| 2018-12 | RAN#82 | RP-182373 | 5309 | 1 | B | CR: Addition of SDR test for 8Rx | 15.5.0 |
| 2018-12 | RAN#82 | RP-182368 | 5312 | 1 | B | CR: SDR test cases with 1024QAM DL | 15.5.0 |
| 2018-12 | RAN#82 | RP-182368 | 5313 | 1 | B | CR: For 1024QAM DL CSI requirements | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5314 | 2 | F | CR for 36.101: PC2 UTRA ACLR exemption list update | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5317 | 2 | F | CR for 36.101: Introduction of a PC3 UTRA ACLR exemption list | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5318 | 1 | F | CR to TS 36.101 – revision of OOB for B42 | 15.5.0 |
| 2018-12 | RAN#82 | RP-182388 | 5319 | 2 | F | CR to TS 36.101 – Add RF requirements for CA 66C | 15.5.0 |
| 2018-12 | RAN#82 | RP-182373 | 5320 |  | B | CR: Addition of CQI tests for 8Rx | 15.5.0 |
| 2018-12 | RAN#82 | RP-182376 | 5195 | 1 | B | Introduction of band 53 into TS 36.101 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182375 | 5202 |  | B | Introducing CR on new xDL/2UL CA band combinations in TS36.101 rel-16 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182375 | 5208 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5) with 1 band UL to TS36.101 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182377 | 5220 |  | B | CR of adding LTE B65 for UE category NB1 and NB2 in R16 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182375 | 5292 |  | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182375 | 5297 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 band into Rel-16 TS 36.101 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182375 | 5300 |  | B | Introduction of Rel-16 LTE Intra-band combinations in 36.101 | 16.0.0 |
| 2018-12 | RAN#82 | RP-182375 | 5302 |  | B | Introduction of completed LTE CA for 3 bands DL with 1 bands UL into Rel-16 TS 36.101 | 16.0.0 |
| 2019-03 | RAN#83 | RP-190401 | 5327 | 1 | A | V2X UE protection to NR bands in TS36.101 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190405 | 5374 |  | A | Correction of UE demodulation requirements for SPDCCH | 16.1.0 |
| 2019-03 | RAN#83 | RP-190405 | 5376 |  | A | Correction of UE demodulation requirements for Slot/Subslot-PDSCH | 16.1.0 |
| 2019-03 | RAN#83 | RP-190405 | 5378 |  | A | Correction of sTTI CQI reporting test | 16.1.0 |
| 2019-03 | RAN#83 | RP-190406 | 5362 |  | A | CR: Addition of performance requirements for FeNB-IoT TDD NPBCH(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190406 | 5366 |  | A | CR: Addition of performance requirements for FeNB-IoT TDD NPDSCH(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190406 | 5364 | 1 | A | CR: Addition of performance requirements for FeNB-IoT TDD NPDCCH(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190408 | 5352 |  | A | CR: Addition of FRC for 8Rx(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190408 | 5354 |  | A | CR: Updates to the applicability and test rule for 8Rx capble UE(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190408 | 5356 |  | A | CR: Updates to 8Rx demodulation performance requirements(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190408 | 5358 |  | A | CR: Updates to 8Rx SDR tests(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190408 | 5360 |  | A | CR: Updates to 8Rx CQI tests(Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190409 | 5324 |  | B | Introducing CR on new x bands (x=3,4,5) DL with 2 bands UL inter-band CA in TS36.101 rel-16 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190409 | 5329 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5) with 1 band UL to TS36.101 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190409 | 5347 |  | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190409 | 5388 |  | B | Introduction of Rel-16 LTE Intra-band combinations in 36.101 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190409 | 5402 |  | B | Introduction of completed LTE CA for 3 bands DL with 1 bands UL into Rel-16 TS 36.101 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190411 | 5341 |  | A | CR on protection Band 32, 75 and 76 for Band 28 and corresponding band combinations | 16.1.0 |
| 2019-03 | RAN#83 | RP-190414 | 5372 |  | A | CR: Correction to 4Rx TDD CQI TC 9.9.1.4.2 (Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190415 | 5336 |  | A | CR on absolut power tolerance for V2X | 16.1.0 |
| 2019-03 | RAN#83 | RP-190415 | 5401 |  | A | Correction of PCmax requirement for V2X | 16.1.0 |
| 2019-03 | RAN#83 | RP-190415 | 5344 | 1 | A | Corrections to Rel-16 CA configurations | 16.1.0 |
| 2019-03 | RAN#83 | RP-190420 | 5349 |  | A | CR to 36.101: frequency offset between anchor and non-anchor carrier for TDD NB-IoT standalone operation | 16.1.0 |
| 2019-03 | RAN#83 | RP-190420 | 5368 |  | A | CR: Updates to test cases for 1024QAM (Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190420 | 5385 |  | A | CR for TDD requirements for network-based CRS interference mitigation (Rel-16) | 16.1.0 |
| 2019-03 | RAN#83 | RP-190420 | 5323 | 1 | A | CR to 36.101 on simulation parameters and FRCs for 1024QAM testcases | 16.1.0 |
| 2019-03 | RAN#83 | RP-190421 | 5380 |  | A | Correction of PDSCH demodulation requirements for eFeMTC | 16.1.0 |
| 2019-03 | RAN#83 | RP-190421 | 5382 |  | A | Correction of CQI reporting test requirements for eFeMTC | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5331 |  | A | Editorial correction R15 CA | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5406 |  | A | Correction on eV2X demodulation requirements | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5405 |  | A | CR TS 36.101 Update of LAA REFSENS exclusion region for B25 and B12 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5403 |  | A | CR TS 36.101 Introduction of a PC3 UTRA ACLR exemption list for CA | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5333 | 1 | A | CA Rx requirement for more than five downlink carriers | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5346 | 1 | A | Corrections to Rel-16 CA configurations | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5383 | 1 | A | Alignment of Foob related description for 36.101 | 16.1.0 |
| 2019-03 | RAN#83 | RP-190422 | 5408 | 1 | A | CR to 36.101 for CA configuration on CA\_3A-41C-42C | 16.1.0 |
| 2019-06 | RAN#84 | RP-191261 | 5413 | 1 | A | CR to exclude 100kHz for NBIOT for B26 band edge operation | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5415 | 2 | A | CR for 36.101 adding band 46 for Rx spurious emissions(Rel-16) | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5421 |  | A | Finalize UE demodulation requirements for CRS-IM | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5423 |  | A | Finalize UE demodulation requirements for sTTI | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5425 |  | A | Finalize CQI reporting test for sTTI | 16.2.0 |
| 2019-06 | RAN#84 | RP-191267 | 5427 |  | A | Editorial corrections for 36.101 CA OOB additional spectrum emission requirements | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5431 |  | A | Update 4Rx Requirement for Band 30 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191264 | 5435 | 1 | A | CR for correcting A-MPR for subPRB for CAT-M1 and CAT-M2 type A | 16.2.0 |
| 2019-06 | RAN#84 | RP-191264 | 5437 |  | A | CR: Updates to V2X test applicability(Rel-16) | 16.2.0 |
| 2019-06 | RAN#84 | RP-191265 | 5441 |  | A | CR on antenna configurations for NB-IoT demodualtion performance requirements (Rel-16) | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5444 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 bands UL into Rel-16 TS 36.101 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5446 | 1 | A | Shadow CR for TS 36.101: CA\_NS\_04 A-MPR Corrections (Rel-16) | 16.2.0 |
| 2019-06 | RAN#84 | RP-191258 | 5447 | 1 | F | CR for TS 36.101: Add B25 MSD for CA\_25-41 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191256 | 5449 | 1 | B | Introduction of bands 87 and 88 into TS 36.101 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191259 | 5453 |  | A | Correction to demodulation of PDCCH for LAA | 16.2.0 |
| 2019-06 | RAN#84 | RP-191266 | 5455 |  | A | CR: cleanup for LTE 8Rx DL (Rel-16) | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5458 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 bands UL into Rel-16 TS 36.101 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191261 | 5461 | 1 | A | CR to Rel-16 TS 36.101 CA\_NS\_08 A-MPR | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5465 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5) with 1 band UL to TS36.101 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191267 | 5470 |  | A | CR to TS 36.101 - NB-IoT REFSENS requirement being band agnostic | 16.2.0 |
| 2019-06 | RAN#84 | RP-191259 | 5474 |  | A | Correction to demodulation of PDSCH LAA | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5475 |  | B | Introducing CR on new x bands (x=3,4,5) DL with 2 bands UL inter-band CA in TS36.101 rel-16 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5476 |  | B | Introducing CR on new x bands (x=3,4,5) DL with 2 bands UL inter-band CA in TS36.101 rel-16 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5478 |  | B | Introduction of completed R16 3DL band combinations to TS 36.101 | 16.2.0 |
| 2019-06 | RAN#84 | RP-191255 | 5480 | 1 | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.2.0 |
| 2019-09 | RAN#85 | RP-192056 | 5484 |  | A | Correction to reference sensitivity for Band 74 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192056 | 5490 |  | A | CR to 36.101 rel. 16 to fix Out-of-band Blocking issue for bands 51, 76 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192051 | 5494 |  | A | Correction to RMC for Cat M1 CSI tests | 16.3.0 |
| 2019-09 | RAN#85 | RP-192041 | 5495 | 3 | B | CR: Demod test definition for HST in 500km/h speed | 16.3.0 |
| 2019-09 | RAN#85 | RP-192056 | 5497 |  | A | CR to 36.101 NS\_40, NS\_41, NS\_42 spurious emission requirement | 16.3.0 |
| 2019-09 | RAN#85 | RP-192045 | 5498 |  | B | Introduction of PC2 for Category HD-FDD M1 and M2 UE operating on bands 31 and 72 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192051 | 5502 |  | A | CR for Narrowband blocking for LTE CatM1/M2 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192042 | 5503 | 1 | B | Introduction of LTE-A inter-band CA Rel-16 for new x bnads (x=3,4,5) DL with 2 bands UL to TS36.101 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192052 | 5506 |  | A | Correction to B70 UE Co-existence | 16.3.0 |
| 2019-09 | RAN#85 | RP-192042 | 5511 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5) with 1 band UL to TS36.101 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192042 | 5512 |  | B | Introduction of completed R16 3DL band combinations to TS 36.101 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192052 | 5513 | 1 | A | CR for 36.101 Pcmax for V2X\_v16 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192043 | 5519 | 1 | B | CR of adding LTE B42/B43 for UE category NB1/NB2 and CAT\_M1/M2 in R16 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192043 | 5520 | 1 | B | CR of adding LTE B7 for UE category NB1/NB2 in R16 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192042 | 5521 |  | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192056 | 5522 |  | A | CR for 36.101: adding spurious emission band UE co-existence for CA\_1-41 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192042 | 5524 | 1 | F | Rel-16 CR to 36.101 to correct typos | 16.3.0 |
| 2019-09 | RAN#85 | RP-192056 | 5526 | 1 | A | Update NS\_40 into TS 36.101 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192056 | 5527 | 1 | A | Update NS\_42 into TS 36.101 | 16.3.0 |
| 2019-09 | RAN#85 | RP-192042 | 5529 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 bands UL into Rel-16 TS 36.101 | 16.3.0 |
| 2019-12 | RAN#86 | RP-193046 | 5537 |  | A | CR: Updates to HST-SFN channel model (Rel-16) | 16.4.0 |
| 2019-12 | RAN#86 | RP-193044 | 5552 | 1 | F | CR to 36.101 to revise LTE CA\_NS\_04 AMPR for BW class D | 16.4.0 |
| 2019-12 | RAN#86 | RP-193043 | 5555 |  | A | CR to 36.101 to revise CA\_NS\_04 AMPR for BW Class C | 16.4.0 |
| 2019-12 | RAN#86 | RP-193043 | 5558 |  | A | CR to 36.101 rel. 15 to fix Out-of-band Blocking issue for bands 38, 41 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193043 | 5560 |  | A | CR to 36.101 rel. 15 to fix Out-of-band Blocking issue for bands 32 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193027 | 5561 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5) with 1 band UL to TS36.101 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193027 | 5562 |  | D | Remove double entry of CA\_41F | 16.4.0 |
| 2019-12 | RAN#86 | RP-193049 | 5564 |  | A | Correction of Note number in Table 5.6.1-1 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193046 | 5567 |  | A | DeltaTib for CA\_1-7-46 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193046 | 5570 |  | A | CR for correction on Rel-14 eFDMIMO PMI test cases with advanced codebook for TS 36.101 (Rel-16) | 16.4.0 |
| 2019-12 | RAN#86 | RP-193044 | 5571 | 3 | B | Adding Band40 for UE category 1bis into Rel-16 TS 36.101 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193027 | 5573 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL into TS36.101 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193043 | 5578 |  | A | Correction to intraband contiguous CA in-band and out-of-band blocking tables REL-16 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193026 | 5579 | 1 | B | CR on introducing UE demodulation tests for 500km/h velocity | 16.4.0 |
| 2019-12 | RAN#86 | RP-193026 | 5580 | 1 | B | Introduction of CA PDSCH demodulation requirements with HST-SFN | 16.4.0 |
| 2019-12 | RAN#86 | RP-193023 | 5581 | 1 | B | CR to TS 36.101 - NB-IoT in NR in-band support clarifications | 16.4.0 |
| 2019-12 | RAN#86 | RP-193027 | 5583 |  | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193026 | 5584 | 1 | B | CR for Addition of test applicability rule for LTE HST CA test(Re-16) | 16.4.0 |
| 2019-12 | RAN#86 | RP-193027 | 5587 |  | B | Introduction of completed R16 3DL band combinations to TS 36.101 | 16.4.0 |
| 2019-12 | RAN#86 | RP-193046 | 5588 |  | A | CR for 36.101 UE-to-UE coexistence for V2X\_v16 | 16.4.0 |
| 2020-03 | RAN#87-e | RP-200414 | 5591 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5) with 1 band UL to TS36.101 | 16.5.0 |
| 2020-03 | RAN#87-e | RP-200414 | 5593 |  | A | Mirror CR for 36.101: Missing Pcmax tolerance for 23-33 dBm in Table 6.2.5A-2 and Table 6.2.5B-1 | 16.5.0 |
| 2020-03 | RAN#87-e | RP-200412 | 5596 |  | F | CR to TS 36.101: Finalization on PDSCH demodulation with 500km/h velocity | 16.5.0 |
| 2020-03 | RAN#87-e | RP-200414 | 5599 |  | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.5.0 |
| 2020-03 | RAN#87-e | RP-200500 | 5601 |  | B | Introduction of completed R16 3DL band combinations to TS 36.101 | 16.5.0 |
| 2020-03 | RAN#87-e | RP-200416 | 5602 | 1 | B | CR for TS 36.101-1 Introduction of new SRS requirements for LTE eMIMO | 16.5.0 |
| 2020-03 | RAN#87-e | RP-200384 | 5595 | 1 | B | Introducing new channel bandwidth for band n28 | 16.5.0 |
| 2020-06 | RAN#88 | RP-201060 | 5608 |  | A | CR Coexistence cleanup for 36101 Rel16 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200988 | 5613 |  | A | CR for TS 36.101: CR for spec corrections for MSD table | 16.6.0 |
| 2020-06 | RAN#88 | RP-201060 | 5615 |  | A | Corrections of CA band combo table | 16.6.0 |
| 2020-06 | RAN#88 | RP-200988 | 5618 |  | A | Mirror CR for 36.101: fix modifiedMPRbehavior for NS\_31 | 16.6.0 |
| 2020-06 | RAN#88 | RP-201060 | 5619 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL to TS36.101 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200961 | 5620 |  | B | Adding Band34 for UE category 1bis into Rel-16 TS 36.101 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200988 | 5622 |  | A | CR: Updates to FeNB-IoT UE performance requirements in 36.101 (Rel-16) | 16.6.0 |
| 2020-06 | RAN#88 | RP-200991 | 5627 |  | A | CR: Updates to LTE CQI test cases 9.2.1.7 and 9.2.1.8 (Rel-16) | 16.6.0 |
| 2020-06 | RAN#88 | RP-200988 | 5629 |  | A | CR: Introduction for intra-band contiguous CA performance requirements for FDD with minimum channel spacing (Rel-16) | 16.6.0 |
| 2020-06 | RAN#88 | RP-201060 | 5633 |  | B | Introduction of Rel-16 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS36101 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200988 | 5636 |  | A | CR to remove TBD and braket on CAT-M2 Type A for Rel-16 | 16.6.0 |
| 2020-06 | RAN#88 | RP-201060 | 5638 |  | F | CR Rel-16 for editorial corrections TS 36.101 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200967 | 5639 |  | F | CR for Band 53 NS\_45 requirement and OOB blocking | 16.6.0 |
| 2020-06 | RAN#88 | RP-201045 | 5640 | 1 | B | Addition of UE coexistence between US bands and NR Band n77 | 16.6.0 |
| 2020-06 | RAN#88 | RP-201060 | 5641 |  | B | Introduction of completed R16 3DL band combinations to TS 36.101 | 16.6.0 |
| 2020-06 | RAN#88 | RP-201060 | 5646 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 bands UL into Rel-16 TS 36.101 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200989 | 5649 |  | A | CR to remove TBD for A-MPR for NS\_33 in 36.101 Rel-16 | 16.6.0 |
| 2020-06 | RAN#88 | RP-200988 | 5651 |  | A | CR to remove TBD in in clause 6.6.3 in 36.101 Rel-16 | 16.6.0 |
| 2020-09 | RAN#89 | RP-201512 | 5653 |  | A | Correction to band 85 spurious emission limits UE co-existence | 16.7.0 |
| 2020-09 | RAN#89 | RP-201535 | 5654 | 1 | F | Coexistence cleanup for 36101 Rel16 | 16.7.0 |
| 2020-09 | RAN#89 | RP-201512 | 5656 | 2 | F | A-MPR definition for CA\_48B | 16.7.0 |
| 2020-09 | RAN#89 | RP-201512 | 5659 |  | A | Correction of OCNG configuration for LAA SDR requirements | 16.7.0 |
| 2020-09 | RAN#89 | RP-201512 | 5661 |  | A | Addition of applicability for MTC UE capable of 64QAM DL | 16.7.0 |
| 2020-09 | RAN#89 | RP-201508 | 5662 | 1 | B | Introduction of enhanced MPDCCH demodulation requirements | 16.7.0 |
| 2020-09 | RAN#89 | RP-201508 | 5663 | 1 | B | Introduction of CSI-RS based PMI reporting test for non-BL UEs | 16.7.0 |
| 2020-09 | RAN#89 | RP-201512 | 5667 |  | F | Correction of band combinations table in Rel-16 | 16.7.0 |
| 2020-09 | RAN#89 | RP-201510 | 5669 | 1 | B | CR to 36.101: Introduction of LTE based 5G terrestrial broadcast numerologies | 16.7.0 |
| 2020-09 | RAN#89 | RP-201512 | 5670 |  | A | Update to NB-IOT aggregate power control tolerance for TDD | 16.7.0 |
| 2020-09 | RAN#89 | RP-201510 | 5671 | 1 | B | CR addition on LTE-based 5G terrestrial broadcast | 16.7.0 |
| 2020-09 | RAN#89 | RP-201509 | 5672 | 1 | B | CR: Introduce NPDSCH performance requirements for multi-TB interleaved transmission. | 16.7.0 |
| 2020-09 | RAN#89 | RP-201535 | 5673 |  | F | CR to 36.101 Removal band 10 protection | 16.7.0 |
| 2020-09 | RAN#89 | RP-201535 | 5675 |  | F | CR to 36.101 Correction to CA\_NS\_10 | 16.7.0 |
| 2020-12 | RAN#90 | RP-202484 | 5676 |  | F | Correction of B88 UL EARFCN | 17.0.0 |
| 2020-12 | RAN#90 | RP-202493 | 5682 | 1 | A | Clarifications and corrections on UE co-ex requirements(R16) | 17.0.0 |
| 2020-12 | RAN#90 | RP-202484 | 5683 |  | F | LTE CA corrections | 17.0.0 |
| 2020-12 | RAN#90 | RP-202482 | 5684 |  | F | Band 88 and 87 bracket removal | 17.0.0 |
| 2020-12 | RAN#90 | RP-202484 | 5686 |  | F | Coexistence cleanup for 36101 Rel16 | 17.0.0 |
| 2020-12 | RAN#90 | RP-202498 | 5690 |  | A | CR for 36.101 to clarify the SCS supports for LTE MBMS (Rel-16) | 17.0.0 |
| 2020-12 | RAN#90 | RP-202512 | 5693 | 1 | A | CR on cleanup for LTE FeMBMS(Rel-16) | 17.0.0 |
| 2020-12 | RAN#90 | RP-202481 | 5694 | 1 | F | CR on cleanup for LTE-based 5G terrestrial broadcast | 17.0.0 |
| 2020-12 | RAN#90 | RP-202474 | 5696 | 1 | F | CR: Cleanup for NPDSCH performance requirements for multi-TB interleaved transmission in TS 36.101 | 17.0.0 |
| 2020-12 | RAN#90 | RP-202492 | 5698 | 2 | A | CR for 36.101: Cleanup for performance requirements of sTTI (Rel-16) | 17.0.0 |
| 2020-12 | RAN#90 | RP-202473 | 5700 |  | F | Clean up of enhanced MPDCCH demodulation requirements | 17.0.0 |
| 2020-12 | RAN#90 | RP-202473 | 5701 | 1 | F | Clean up of CSI-RS based PMI reporting test for non-BL UEs | 17.0.0 |
| 2020-12 | RAN#90 | RP-202510 | 5703 | 1 | A | CR Correction to B72 coex - CA\_NS\_08 - Band 10 protection 36.101 Rel16 | 17.0.0 |
| 2020-12 | RAN#90 | RP-202477 | 5707 | 1 | F | CR for editorial corrections 36.101 | 17.0.0 |
| 2020-12 | RAN#90 | RP-202477 | 5708 |  | F | CR for 36.101: Corrections for UL CA\_41D | 17.0.0 |
| 2020-12 | RAN#90 | RP-202476 | 5709 |  | B | Introduction of completed R17 3DL band combinations to TS 36.101 | 17.0.0 |
| 2021-03 | RAN#91 | RP-210188 | 5715 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL to TS36.101 | 17.1.0 |
| 2021-03 | RAN#91 | RP-210110 | 5716 | 1 | B | CR of adding LTE B24 for UE category NB1/NB2 in R17 | 17.1.0 |
| 2021-03 | RAN#91 | RP-210119 | 5719 |  | A | CR for missing B48 references in a table and note | 17.1.0 |
| 2021-03 | RAN#91 | RP-210187 | 5720 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4,5) with 1 band UL to TS36.101 | 17.1.0 |
| 2021-03 | RAN#91 | RP-210109 | 5722 |  | A | CR for 36.101 to add missing spurious emissions for band 38 UE co-existence (Rel-17) | 17.1.0 |
| 2021-03 | RAN#91 | RP-210185 | 5723 |  | B | Introduction of Rel-17 LTE inter-band CA for 2 bands DL with 1 band UL combinations in TS 36.101 | 17.1.0 |
| 2021-03 | RAN#91 | RP-210109 | 5726 |  | A | CR for TS 36.101: Cleanup for spurious emissions for UE co-existence table | 17.1.0 |
| 2021-03 | RAN#91 | RP-210186 | 5727 |  | B | Introduction of completed R17 3DL band combinations to TS 36.101 | 17.1.0 |
| 2021-03 | RAN#91 | RP-210111 | 5734 | 1 | A | CR for 36.101: Corrections related to Band 24 regulatory updates | 17.1.0 |
| 2021-06 | RAN#92 | RP-211076 | 5739 |  | A | Correction of LTE 5DL CA demodulation requirements | 17.2.0 |
| 2021-06 | RAN#92 | RP-211076 | 5742 |  | A | Correction to NB-IoT TDD RMCs | 17.2.0 |
| 2021-06 | RAN#92 | RP-211076 | 5747 |  | A | Correction to NB-IoT HD-FDD RMCs | 17.2.0 |
| 2021-06 | RAN#92 | RP-211079 | 5749 |  | F | CR LTE CA corrections R17 CAT F | 17.2.0 |
| 2021-06 | RAN#92 | RP-211092 | 5758 |  | A | CR for updates related to LTE band 24 in 36.101 (Rel-17) | 17.2.0 |
| 2021-06 | RAN#92 | RP-211092 | 5769 |  | A | CR to TS 36.101[R17]: Addition of UE co-existence requirements for band 40 | 17.2.0 |
| 2021-06 | RAN#92 | RP-211077 | 5774 |  | A | Cleanup for UE co-existence 36.101 Rel-17 | 17.2.0 |
| 2021-06 | RAN#92 | RP-211120 | 5776 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL to TS36.101 | 17.2.0 |
| 2021-06 | RAN#92 | RP-211093 | 5791 |  | A | CR of updating the subPRB UE aspect | 17.2.0 |
| 2021-06 | RAN#92 | RP-211120 | 5795 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 bands UL into Rel-17 TS 36.101 | 17.2.0 |
| 2021-06 | RAN#92 | RP-211110 | 5799 |  | A | Mirror CR for 36.101: Introduction of NS Signalling for NB-IoT in the USA | 17.2.0 |
| 2021-09 | RAN#93 | RP-211914 | 5800 |  | B | Big CR to TS36.101: Rel-17 LTE inter-band CA for 2 bands DL and 1 band UL CA | 17.3.0 |
| 2021-09 | RAN#93 | RP-211920 | 5808 |  | A | CR for updates related to LTE band 24 in 36.101 (Rel-17) | 17.3.0 |
| 2021-09 | RAN#93 | RP-211918 | 5810 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL to TS36.101 | 17.3.0 |
| 2021-09 | RAN#93 | RP-211916 | 5812 |  | B | Introduction of LTE inter-band Carrier Aggregation for x bands DL (x=4, 5, 6) with 1 band UL to TS36.101 | 17.3.0 |
| 2021-09 | RAN#93 | RP-211919 | 5813 |  | B | CR on adding B24 for Cat-M1\_M2 36.101 | 17.3.0 |
| 2021-09 | RAN#93 | RP-211917 | 5814 |  | B | Introduction of completed LTE CA for 2 bands DL with 2 bands UL into Rel-17 TS 36.101 | 17.3.0 |
| 2021-09 | RAN#93 | RP-211915 | 5815 |  | B | Introduction of completed R17 3DL band combinations to TS 36.101 | 17.3.0 |
| 2021-09 | RAN#93 | RP-211919 | 5816 |  | B | CR for adding MOP for LTE Band 24 for UE categories M1 and M2 | 17.3.0 |
| 2021-09 | RAN#93 | RP-211914 | 5821 |  | A | Big CR for TS 36.101 Maintenance(Rel-17) | 17.3.0 |
| 2021-12 | RAN#94 | RP-212842 | 5822 |  | B | CR for adding A-MPR for LTE Band 24 for UE categories M1 and M2 | 17.4.0 |
| 2021-12 | RAN#94 | RP-212844 | 5830 |  | A | CR to clarify default Tx-Rx spacing for LTE band 24 | 17.4.0 |
| 2021-12 | RAN#94 | RP-212843 | 5835 | 1 | B | CR IBE mask and MPR for NB-IoT 16-QAM | 17.4.0 |
| 2021-12 | RAN#94 | RP-212841 | 5836 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL to TS36.101 | 17.4.0 |
| 2021-12 | RAN#94 | RP-212838 | 5838 |  | B | Big CR to TS36.101: Rel-17 LTE inter-band CA for 2 bands DL and 1 band UL CA | 17.4.0 |
| 2021-12 | RAN#94 | RP-212840 | 5839 |  | B | Big CR to TS36.101: LTE Advanced inter-band CA Rel-17 for x bands DL (x=4, 5, 6) with 1 band UL | 17.4.0 |
| 2021-12 | RAN#94 | RP-212824 | 5843 |  | F | Big CR for TS 36.101 Maintenance (Rel-17) | 17.4.0 |
| 2021-12 | RAN#94 | RP-212839 | 5845 |  | F | Big CR to TS36.101: Introduction of completed R17 3DL band combinations to TS 36.101 | 17.4.0 |
| 2022-03 | RAN#95 | RP-220348 | 5850 |  | B | Big CR to TS36.101: Rel-17 LTE inter-band CA for 2 bands DL and 1 band UL CA | 17.5.0 |
| 2022-03 | RAN#95 | RP-220348 | 5852 |  | B | Big CR for TS 36.101: Introduction of completed LTE CA for 2 bands DL with 2 bands UL (Rel-17) | 17.5.0 |
| 2022-03 | RAN#95 | RP-220348 | 5853 |  | B | Big CR to TS36.101: LTE Advanced inter-band CA Rel-17 for x bands DL (x=4, 5, 6) with 1 band UL | 17.5.0 |
| 2022-03 | RAN#95 | RP-220347 | 5848 | 1 | B | Introduction of upper 700MHz A block into TS 36.101 | 17.5.0 |
| 2022-03 | RAN#95 | RP-220348 | 5851 | 1 | F | CR for 36.101 on LTE REFSENS exception simplification | 17.5.0 |
| 2022-03 | RAN#95 | RP-220330 | 5857 |  | A | Big CR for TS 36.101 Maintenance (Rel-17) | 17.5.0 |
| 2022-03 | RAN#95 | RP-220348 | 5858 |  | B | Big CR to TS 36.101: LTE inter-band Carrier Aggregation for 3 bands DL with 1 band UL | 17.5.0 |
| 2022-06 | RAN#96 | RP-221669 | 5859 |  | B | Introduction of LTE-A inter-band CA for x bands (x=3,4,5) DL with 2 bands UL to TS36.101 | 17.6.0 |
| 2022-06 | RAN#96 | RP-221654 | 5860 | 1 | F | CR 36101-h50 adding fallbacks | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5862 |  | B | Big CR on Introduction of completed R17 3DL 1 UL CA band combinations to TS 36.101 | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5863 |  | B | Big CR to TS36.101: Rel-17 LTE inter-band CA for 2 bands DL and 1 band UL CA | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5867 |  | F | LTE CA corrections R17 | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5868 |  | B | Big CR for TS 36.101: Introduction of completed LTE CA for 2 bands DL with 2 bands UL (Rel-17) | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5869 |  | F | CR for TS 36.101 Rel-17: Corrections on band combinations for UE co-existence | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5870 |  | B | Big CR to TS 36.101: LTE Advanced inter-band CA Rel-17 for x bands DL (x=4, 5, 6) with 1 band UL | 17.6.0 |
| 2022-06 | RAN#96 | RP-221667 | 5874 |  | F | Big CR for TS 36.101 Maintenance (Rel-17) | 17.6.0 |
| 2022-06 | RAN#96 | RP-221669 | 5875 |  | B | CR on adding B48 for M1/M2/NB1/NB2 | 17.6.0 |
| 2022-09 | RAN#97-e | RP-222028 | 5876 |  | F | CR 36.101: Rel-17 Adding missing fallback combinations and bug fixes | 17.7.0 |
| 2022-09 | RAN#97-e | RP-222029 | 5880 |  | B | Big CR for TS 36.101 for Rel-17 NB-IoT and eMTC UE performance requirements | 17.7.0 |
| 2022-09 | RAN#97-e | RP-222024 | 5888 |  | F | Big CR for 36.101 maintenance (Rel-17) | 17.7.0 |
| 2022-12 | RAN#98-e | RP-223309 | 5891 |  | F | CR addition of protection for n100 and n101 into 36.101 | 17.8.0 |
| 2022-12 | RAN#98-e | RP-223298 | 5892 | 1 | F | LTE CA corrections | 17.8.0 |
| 2022-12 | RAN#98-e | RP-223298 | 5894 | 1 | F | CR for corrections on Rel-17 band combinations in TS36.101 | 17.8.0 |
| 2022-12 | RAN#98-e | RP-223308 | 5895 |  | F | CR on cleanup for Rel-17 NPDSCH requirements with 16QAM in TS 36.101 | 17.8.0 |