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 assume 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) Segmentation is not included in this formula, but should be considered in the TBS calculation.

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.

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

In Table A.2.1.3-1 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

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD, Full RB allocation, QPSK | | | | | | | | | | |
| 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, Full RB allocation, 16-QAM | | | | | | | | | | |
| 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, Partial RB allocation, QPSK | | | | | | | | | | |
| 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, Partial RB allocation, 16-QAM | | | | | | | | | | |
| 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 |  |
| TDD, Full RB allocation, QPSK | | | | | | | | | | |
| 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, Full RB allocation, 16-QAM | | | | | | | | | | |
| 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, Partial RB allocation, QPSK | | | | | | | | | | |
| 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, Partial RB allocation, 16-QAM | | | | | | | | | | |
| 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 |  |

## 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) | | | | | | | |

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

#### A.2.2.1.3 64-QAM

[FFS]

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

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

#### A.2.2.2.3 64-QAM

[FFS]

### A.2.2.3 Void

Table A.2.2.3-1: Void

## A.2.3 Reference measurement channels for TDD

For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL:2UL.

### 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] | | | | | | | |

#### 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] | | | | | | | |

#### A.2.3.1.3 64-QAM

[FFS]

### 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] | | | | | | | | | | | | |

#### 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] | | | | | | | | | | | | |

#### A.2.3.2.3 64-QAM

[FFS]

### A.2.3.3 Void

Table A.2.3.3-1: Void

# 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.

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) Segmentation is not included in this formula, but should be considered in the TBS calculation.

3. If there is more than one *A* that minimizes the equation above, then the larger value is chosen per default.

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 are listed the DL reference measurement channels specified in annexes A.3.2 to A.3.9 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.3.9 as appropriate.

Table A.3.1.1-1: Overview of DL reference measurement channels

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
| FDD, Receiver requirements | | | | | | | | | |
| 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 |  |
| TDD, Receiver requirements | | | | | | | | | |
| 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 |  |
| FDD, Receiver requirements, Maximum input level for UE Categories 3-5 | | | | | | | | | |
| 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 |  | - |  |
| FDD, Receiver requirements, Maximum input level for UE Categories 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 |  | - |  |
| FDD, Receiver requirements, Maximum input level for UE Categories 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 |  | - |  |
| TDD, Receiver requirements, Maximum input level for UE Categories 3-5 | | | | | | | | | |
| 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, Receiver requirements, Maximum input level for UE Categories 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 |  | - |  |
| TDD, Receiver requirements, Maximum input level for UE Categories 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 |  | - |  |
| FDD, PDSCH Performance, Single-antenna transmission (CRS) | | | | | | | | | |
| 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.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 |  |
| FDD, PDSCH Performance, Single-antenna transmission (CRS), 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 |  |
| FDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (MBSFN Configuration) | | | | | | | | | |
| FDD | Table A.3.3.1-5 | R.29 FDD | 10 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| FDD, PDSCH Performance: Carrier aggregation with power imbalance | | | | | | | | | |
| FDD | Table A.3.3.1-7 | R.49 FDD | 20 | 64QAM | 0.84-0.87 | 100 |  | ≥ 5 |  |
| FDD, PDSCH Performance, Multi-antenna transmission (CRS), 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.11-2 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.3.3.2.1-1 | R.30 FDD | 20 | 16QAM | 1/2 | 100 |  | ≥ 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, PDSCH Performance, Multi-antenna transmission (CRS), 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, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS) | | | | | | | | | |
| FDD | Table A.3.3.3.1-1 | R.51 FDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| FDD, PDSCH Performance (UE specific RS) 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.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 |  |
| TDD, PDSCH Performance, Single-antenna transmission (CRS) | | | | | | | | | |
| 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.3.4.1-2 | 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 |  |
| TDD, PDSCH Performance, Single-antenna transmission (CRS), 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 |  |
| TDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (MBSFN Configuration) | | | | | | | | | |
| TDD | Table A.3.4.1-5 | R.29 TDD | 10 | 16QAM | 1/2 | 1 |  | ≥ 1 |  |
| TDD, PDSCH Performance: Carrier aggregation with power imbalance | | | | | | | | | |
| TDD | Table A.3.4.1-7 | R.49 TDD | 20 | 64QAM | 0.81-087 | 100 |  | ≥ 5 |  |
| TDD, PDSCH Performance, Multi-antenna transmission (CRS), 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.3.4.2.1-1 | 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, PDSCH Performance, Multi-antenna transmission (CRS), 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, PDSCH Performance, Single antenna port (DRS) | | | | | | | | | |
| 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, PDSCH Performance, Two antenna ports (DRS) | | | | | | | | | |
| 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, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS) | | | | | | | | | |
| TDD | Table A.3.4.3.3-1 | R.51 TDD | 10 | 16QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD, PDSCH Performance (UE specific RS) Four antenna ports (CSI-RS) | | | | | | | | | |
| TDD | Table A.3.4.3.4-1 | R.44 TDD | 10 | 64QAM | 1/2 | 50 |  | ≥ 2 |  |
| TDD, PDSCH Performance (UE specific RS) 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 |  |
| FDD, PDCCH / PCFICH Performance | | | | | | | | | |
| 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.16 FDD | 10 | PDCCH |  |  |  |  |  |
| FDD | Table A.3.5.1-1 | R.17 FDD | 5 | PDCCH |  |  |  |  |  |
| TDD, PDCCH / PCFICH Performance | | | | | | | | | |
| 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.16 TDD | 10 | PDCCH |  |  |  |  |  |
| TDD | Table A.3.5.2-1 | R.17 TDD | 5 | PDCCH |  |  |  |  |  |
| FDD / TDD, PHICH Performance | | | | | | | | | |
| FDD / TDD | Table A.3.6-1 | R.18 | 10 | PHICH |  |  |  |  |  |
| FDD / TDD | Table A.3.6-1 | R.19 | 10 | PHICH |  |  |  |  |  |
| FDD / TDD | Table A.3.6-1 | R.20 | 5 | PHICH |  |  |  |  |  |
| FDD / TDD | Table A.3.6-1 | R.24 | 10 | PHICH |  |  |  |  |  |
| FDD / TDD, PBCH Performance | | | | | | | | | |
| 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, PMCH Performance | | | | | | | | | |
| 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 |  |
| TDD, PMCH Performance | | | | | | | | | |
| 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 |  |
| FDD, Sustained data rate (CRS) | | | | | | | | | |
| FDD | Table A.3.9.1-1 | R.31-1 FDD | 10 | 64QAM | 0.40 |  |  | ≥ 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 |  |
| TDD, Sustained data rate (CRS) | | | | | | | | | |
| TDD | Table A.3.9.2-1 | R.31-1 TDD | 10 | 64QAM | 0.40 |  |  | ≥ 1 |  |
| TDD | Table A.3.9.2-1 | R.31-2 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 |  |

## A.3.2 Reference measurement channel for receiver characteristics

Tables A.3.2-1 and A.3.2-2 are applicable for measurements on the Receiver Characteristics (clause 7) with the exception of sub-clause 7.4 (Maximum input level).

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 sub-clause 7.4 (Maximum input level).

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

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.3.2-2 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.3.2-3 Fixed Reference Channel for Maximum input level for UE Categories 3-8 (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.3.2-4 Fixed Reference Channel for Maximum input level for UE Categories 3-8 (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]. | | | | | | | |

## 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.2 FDD |  |  |
| Channel bandwidth | MHz | 1.4 | 20 |  | 10 |  |  |
| Allocated resource blocks (Note 4) |  | 6 | 100 |  | 50 |  |  |
| Allocated subframes per Radio Frame |  | 9 | 9 |  | 9 |  |  |
| Modulation |  | QPSK | QPSK |  | QPSK |  |  |
| Target Coding Rate |  | 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 |  | 4392 |  |  |
| For Sub-Frame 5 | Bits | n/a | n/a |  | n/a |  |  |
| For Sub-Frame 0 | Bits | 152 | 8760 |  | 4392 |  |  |
| Number of Code Blocks  (Notes 3 and 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 |  | 1 | 2 |  | 1 |  |  |
| For Sub-Frame 5 |  | n/a | n/a |  | n/a |  |  |
| For Sub-Frame 0 |  | 1 | 2 |  | 1 |  |  |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 27600 |  | 13800 |  |  |
| For Sub-Frame 5 | Bits | n/a | n/a |  | n/a |  |  |
| For Sub-Frame 0 | Bits | 528 | 26760 |  | 12960 |  |  |
| Max. Throughput averaged over 1 frame  (Note 4) | Mbps | 0.342 | 7.884 |  | 3.953 |  |  |
| UE Category |  | ≥ 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) |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 1 |
| MBSFN Configuration (Note 3) |  | 111111 |
| Allocated subframes per Radio Frame |  | 3 |
| Modulation |  | 16QAM |
| Target Coding Rate |  | 1/2 |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 | Bits | 256 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 256 |
| For Sub-Frame 1,2,3,6,7,8 | Bits | 0 (MBSFN) |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |
| For Sub-Frames 4,9 |  | 1 |
| For Sub-Frame 5 |  | n/a |
| For Sub-Frame 0 |  | 1 |
| For Sub-Frame 1,2,3,6,7,8 |  | 0 (MBSFN) |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4,9 | Bits | 552 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 552 |
| For Sub-Frame 1,2,3,6,7,8 | Bits | 0 (MBSFN) |
| Max. Throughput averaged over 1 frame | kbps | 76.8 |
| 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: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.  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.3.3.1-6: 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: PCell Fixed Reference Channel for CA demodulation with power imbalance

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.49 FDD |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 100 |
| Allocated subframes per Radio Frame |  | 9 |
| Modulation |  | 64QAM |
| Coding Rate |  |  |
| For Sub-Frame 1,2,3,4,6,7,8,9, |  | 0.84 |
| For Sub-Frame 5 |  | N/A |
| For Sub-Frame 0 |  | 0.87 |
| Information Bit Payload |  |  |
| For Sub-Frames 0,1,2,3,4,6,7,8,9 | Bits | 63776 |
| For Sub-Frame 5 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 3) |  |  |
| For Sub-Frames 0,1,2,3,4,6,7,8,9 | Code Blocks | 11 |
| For Sub-Frame 5 | Code Blocks | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 75600 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 73080 |
| Max. Throughput averaged over 1 frame | Mbps | 57.398 |
| UE Category |  | ≥ 5 |
| 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.11-2 FDD | R.11-3 FDD Note 5 | R.11-4 FDD | R.30 FDD | R.35-1 FDD | R.35 FDD |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 | 10 | 20 | 20 | 10 |
| Allocated resource blocks (Note 4) |  | 50 | 50 | 25 | 40 | 50 | 100 | 100 | 50 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 |
| Modulation |  | QPSK | 16QAM | 16QAM | 16QAM | QPSK | 16QAM | 64QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.39 | 1/2 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4392 | 12960 | 5736 | 10296 | 6968 | 25456 | 30576 | 19848 |
| 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 | 4392 | 12960 | 4968 | 10296 | 6968 | 25456 | n/a | 18336 |
| Number of Code Blocks  (Notes 3 and 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 3 | 1 | 2 | 2 | 5 | 5 | 4 |
| 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 | 1 | 3 | 1 | 2 | 2 | 5 | n/a | 3 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 13200 | 26400 | 12000 | 21120 | 13200 | 52800 | 79200 | 39600 |
| 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 | 12384 | 24768 | 10368 | 19488 | 12384 | 51168 | n/a | 37152 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 3.953 | 11.664 | 5.086 | 9.266 | 6.271 | 22.910 | 24.461 | 17.712 |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | 4 | ≥ 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. | | | | | | | | | |

#### 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 |
| Channel bandwidth | MHz | 1.4 | 10 | 10 | 10 | 10 | 20 | 10 |
| Allocated resource blocks (Note 4) |  | 6 | 50 | 50 | 6 | 3 | 100 | 50 |
| Allocated subframes per Radio Frame |  | 9 | 9 | 9 | 8 | 8 | 9 | 9 |
| Modulation |  | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| Information Bit Payload (Note 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 4392 | 12960 | 1544 | 744 | 25456 | 18336 |
| For Sub-Frame 5 | Bits | 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 |
| 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 |
| For Sub-Frame 5 |  | 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 |
| Binary Channel Bits (Note 4) |  |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1248 | 12800 | 25600 | 3072 | 1536 | 51200 | 38400 |
| For Sub-Frame 5 | Bits | 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 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 0.342 | 3.876 | 11.513 | 1.235 | 0.595 | 22.6568 | 16.502 |
| UE Category |  | ≥ 1 | ≥ 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: 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. | | | | | | | | |

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

#### 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 |
| 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 1,4,6,9 | Bits | 11448 |
| For Sub-Frames 2,3,7,8 | Bits | 11448 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 9528 |
| Number of Code Blocks (Note 4) |  |  |
| For Sub-Frames 1,4,6,9 | Code blocks | 2 |
| For Sub-Frames 2,3,7,8 | Code blocks | 2 |
| For Sub-Frame 5 | Bits | n/a |
| ­­ For Sub-Frame 0 | Bits | 2 |
| Binary Channel Bits |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 24000 |
| For Sub-Frames 2,7 |  | 23600 |
| For Sub-Frames 3,8 |  | 23200 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 10.1112 |
| 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.3.3.3.2 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.50 FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks |  | 50 (Note 3) | 50 (Note 3) |
| Allocated subframes per Radio Frame |  | 9 | 9 |
| Modulation |  | QPSK | 64QAM |
| Target Coding Rate |  | 1/3 | 1/2 |
| Information Bit Payload |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 3624 | 18336 |
| For Sub-Frames 2,3,7,8 | Bits | 3624 | 16416 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 2984 | 14688 |
| Number of Code Blocks (Note 4) |  |  |  |
| For Sub-Frames 1,4,6,9 | Code blocks | 1 | 3 |
| For Sub-Frames 2,3,7,8 | Code blocks | 1 | 3 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 1 | 3 |
| Binary Channel Bits |  |  |  |
| For Sub-Frames 1,4,6,9 | Bits | 12000 | 36000 |
| For Sub-Frames 2,7 |  | 11600 | 34800 |
| For Sub-Frames 3,8 |  | 11600 | 34800 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 9840 | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 3.1976 | 15.3696 |
| UE Category |  | ≥ 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: 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.3.3.3.2-2 apply for verifying FDD PMI 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 | | |
| Channel bandwidth | | | MHz | | 10 | | 10 | | | 10 | | |
| Allocated resource blocks | | |  | | 503 | | 503 | | | 39 | | |
| Allocated subframes per Radio Frame | | |  | | 10 | | 10 | | | 10 | | |
| Modulation | | |  | | QPSK | | 16QAM | | | 16QAM | | |
| Target Coding Rate | | |  | | 1/3 | | 1/2 | | | 1/2 | | |
| Information Bit Payload | | |  | |  | |  | | |  | | |
| For Sub-Frames (Non CSI-RS subframe) | | | Bits | | 3624 | | 11448 | | | 8760 | | |
| For Sub-Frames (CSI-RS subframe) | | | Bits | | 3624 | | 11448 | | | 8760 | | |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | | | Bits | | n/a | | n/a | | | n/a | |
| For Sub-Frame 5 | | | Bits | | n/a | | n/a | | | n/a | | |
| For Sub-Frame 0 | | | Bits | | 2984 | | 9528 | | | 8760 | | |
| Number of Code Blocks per Sub-Frame (Note 4) | | |  | |  | |  | | |  | | |
| For Sub-Frames (Non CSI-RS subframe) | | |  | | 1 | | 2 | | | 2 | | |
| For Sub-Frames (CSI-RS subframe) | | |  | | 1 | | 2 | | | 2 | | |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | | | Bits | | n/a | | n/a | | | n/a | | |
| For Sub-Frame 5 | | |  | | n/a | | n/a | | | n/a | | |
| For Sub-Frame 0 | | |  | | 1 | | 2 | | | 2 | | |
| Binary Channel Bits Per Sub-Frame | | |  | |  | |  | | |  | | |
| For Sub-Frames (Non CSI-RS subframe) | | | Bits | | 12000 | | 24000 | | | 18720 | | |
| For Sub-Frames (CSI-RS subframe) | | | Bits | | 11600 | | 23200 | | | 18096 | | |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | | | Bits | | n/a | | n/a | | | n/a | | |
| For Sub-Frame 5 | | | Bits | | n/a | | n/a | | | n/a | | |
| For Sub-Frame 0 | | | Bits | | 9840 | | 19680 | | | 18720 | | |
| Max. Throughput averaged over 1 frame | | | Mbps | | 3.1976 | | 10.1112 | | | 7.884 | | |
| 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  Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]  Note 3: For R.44 and R.45, 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).  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.2 TDD |  |  |
| Channel bandwidth | MHz | 1.4 | 20 |  | 10 |  |  |
| Allocated resource blocks (Note 6) |  | 6 | 100 |  | 50 |  |  |
| Uplink-Downlink Configuration (Note 4) |  | 1 | 1 |  | 1 |  |  |
| Allocated subframes per Radio Frame (D+S) |  | 3 | 3+2 |  | 3+2 |  |  |
| Modulation |  | QPSK | QPSK |  | QPSK |  |  |
| Target Coding Rate |  | 1/3 | 1/3 |  | 1/3 |  |  |
| Information Bit Payload (Note 6) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 408 | 8760 |  | 4392 |  |  |
| For Sub-Frames 1,6 | Bits | n/a | 7736 |  | 3240 |  |  |
| For Sub-Frame 5 | Bits | n/a | n/a |  | n/a |  |  |
| For Sub-Frame 0 | Bits | 208 | 8760 |  | 4392 |  |  |
| Number of Code Blocks (Notes 5 and 6) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 |  | 1 |  |  |
| For Sub-Frames 1,6 |  | n/a | 2 |  | 1 |  |  |
| For Sub-Frame 5 |  | n/a | n/a |  | n/a |  |  |
| For Sub-Frame 0 |  | 1 | 2 |  | 1 |  |  |
| Binary Channel Bits (Note 6) |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 1368 | 27600 |  | 13800 |  |  |
| For Sub-Frames 1,6 | Bits | n/a | 22656 |  | 11256 |  |  |
| For Sub-Frame 5 | Bits | n/a | n/a |  | n/a |  |  |
| For Sub-Frame 0 | Bits | 672 | 26904 |  | 13104 |  |  |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 0.102 | 4.175 |  | 1.966 |  |  |
| UE Category |  | ≥ 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 3) |  | 010010 |
| Uplink-Downlink Configuration (Note4) |  | 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 5) |  |  |
| 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: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.  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.3.4.1-6: 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: PCell Fixed Reference Channel for CA demodulation with power imbalance

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.49 TDD |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks |  | 100 |
| Uplink-Downlink Configuration (Note 1) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Modulation |  | 64QAM |
| Number of OFDM symbols for PDCCH per component carrier |  |  |
| For Sub-Frames 0,4,5,9 | OFDM symbols | 3 |
| For Sub-Frames 1,6 | OFDM symbols | 2 |
| Target Coding Rate |  |  |
| For Sub-Frames 4,9 |  | 0.84 |
| For Sub-Frames 1,6 |  | 0.81 |
| For Sub-Frames 5 |  | N/A |
| For Sub-Frames 0 |  | 0.87 |
| Information Bit Payload |  |  |
| For Sub-Frames 0, 4, 9 | Bits | 63776 |
| For Sub-Frame 1,6 | Bits | 55056 |
| For Sub-Frame 5 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 2) |  |  |
| For Sub-Frames 0, 4, 9 | Code Blocks | 11 |
| For Sub-Frame 1,6 | Code Blocks | 9 |
| For Sub-Frame 5 | Code Blocks | N/A |
| Binary Channel Bits Per Sub-Frame |  |  |
| For Sub-Frames 4,9 | Bits | 75600 |
| For Sub-Frame 1,6 | Bits | 67968 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 73512 |
| Max. Throughput averaged over 1 frame | Mbps | 30.144 |
| UE Category |  | ≥ 5 |
| 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 | 64 QAM | 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. | | | | | | | | | | | | |

#### 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 |
| Channel bandwidth | MHz | 1.4 | 10 | 10 | 10 | 10 | 20 | 10 |
| Allocated resource blocks (Note 6) |  | 6 | 50 | 50 | 6 | 3 | 100 | 50 |
| Uplink-Downlink Configuration (Note 4) |  | 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 |
| Modulation |  | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM |
| Target Coding Rate |  | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| Information Bit Payload (Note 6) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 408 | 4392 | 12960 | 1544 | 744 | 25456 | 18336 |
| For Sub-Frames 1,6 | Bits | n/a | 3240 | 9528 | n/a | n/a | 21384 | 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 | 208 | 4392 | 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 |
| For Sub-Frames 1,6 |  | n/a | 1 | 2 | n/a | n/a | 4 | 3 |
| For Sub-Frame 5 |  | 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 |
| Binary Channel Bits (Note 6) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 1248 | 12800 | 25600 | 3072 | 1536 | 51200 | 38400 |
| For Sub-Frames 1,6 |  | n/a | 10256 | 20512 | n/a | n/a | 41312 | 30768 |
| For Sub-Frame 5 | Bits | 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 |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 0.102 | 1.966 | 4.498 | 0.309 | 0.149 | 9.368 | 6.835 |
| UE Category |  | ≥ 1 | ≥ 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. 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. | | | | | | | | |

### 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. | | | | | | | |

#### 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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reference channel |  | R.31 TDD | R.32 TDD | R.32-1 TDD | R.33 TDD | R.33-1  TDD | R.34  TDD |  |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 | 10 | 10 |  |
| Allocated resource blocks |  | 50 4 | 50 4 | 25 4 | 50 4 | 18 6 | 50 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 |  |
| Modulation |  | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 64QAM |  |
| Target Coding Rate |  | 1/3 | 1/2 | 1/2 | 3/4 | 3/4 | 1/2 |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 3624 | 11448 | 5736 | 27376 | 9528 | 18336 |  |
| For Sub-Frames 1,6 |  | 2664 | 7736 | 3112 | 16992 | 7480 | 11832 |  |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |  |
| For Sub-Frame 0 | Bits | 2984 | 9528 | 3496 | 22152 | 9528 | 14688 |  |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 1 | 2 | 1 | 5 | 2 | 3 |  |
| For Sub-Frames 1,6 |  | 1 | 2 | 1 | 3 | 2 | 2 |  |
| 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 | 3 |  |
| Binary Channel Bits Per Sub-Frame |  |  |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 12000 | 24000 | 10800 | 36000 | 12960 | 36000 |  |
| For Sub-Frames 1,6 |  | 7872 | 15744 | 6528 | 23616 | 10368 | 23616 |  |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |  |
| For Sub-Frame 0 | Bits | 9840 | 19680 | 7344 | 29520 | 12960 | 29520 |  |
| Max. Throughput averaged over 1 frame | Mbps | 1.556 | 4.79 | 2.119 | 11.089 | 4.354 | 7.502 |  |
| UE Category |  | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 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: For R.31, R.32, R.33and R.34, 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. | | | | | | | | |

#### 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 |
| 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-Frames 4,9 (non CSI-RS subframe) | Bits | 11448 |
| For Sub-Frame 4,9 | Bits | 11448 |
| For Sub-Frames 1,6 | Bits | 7736 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 9528 |
| Number of Code Blocks  (Note 4) |  |  |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Code blocks | 2 |
| For Sub-Frames 4,9 | Code blocks | 2 |
| For Sub-Frames 1,6 | Code blocks | 2 |
| For Sub-Frame 5 |  | n/a |
| For Sub-Frame 0 | Code blocks | 2 |
| Binary Channel Bits |  |  |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Bits | 24000 |
| For Sub-Frames 4,9 |  | 22800 |
| For Sub-Frames 1,6 |  | 15744 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 4.7896 |
| 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.3.4.3.4 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 |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Modulation |  | 64QAM |
| Target Coding Rate |  | ½ |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 18336 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 16416 |
| For Sub-Frames 1,6 |  | 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 4,9 (non CSI-RS subframe) |  | 3 |
| For Sub-Frames 4,9 (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 4,9 (non CSI-RS subframe) | Bits | 36000 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 33600 |
| For Sub-Frames 1,6 |  | 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.  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). | | |

#### 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 |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks |  | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) |  | 1 |
| Allocated subframes per Radio Frame (D+S) |  | 3+2 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 1/3 |
| Information Bit Payload |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 3624 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 3624 |
| For Sub-Frames 1,6 |  | 2664 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 2984 |
| Number of Code Blocks per Sub-Frame (Note 5) |  |  |
| For Sub-Frames 4,9 (non CSI-RS subframe) |  | 1 |
| For Sub-Frames 4,9 (CSI-RS subframe) |  | 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 (non CSI-RS subframe) | Bits | 12000 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 10400 |
| For Sub-Frames 1,6 |  | 7872 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 9840 |
| Max. Throughput averaged over 1 frame | Mbps | 1.556 |
| 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: 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). | | |

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 | |  | |
| Channel bandwidth | | MHz | 10 | 10 | |  | |
| Allocated resource blocks | |  | 504 | 39 | |  | |
| Uplink-Downlink Configuration (Note 3) | |  | 1 | 1 | |  | |
| Allocated subframes per Radio Frame (D+S) | |  | 4+2 | 4+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 | 11448 | 8760 | |  | |
| For Sub-Frames 1,6 | | Bits | 7736 | 7480 | |  | |
| For Sub-Frame 5 | | Bits | n/a | n/a | |  | |
| For Sub-Frame 0 | | Bits | 9528 | 8760 | |  | |
| 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 | 22400 | 17472 | |  | |
| For Sub-Frames 1,6 | | Bits | 15744 | 14976 | |  | |
| For Sub-Frame 5 | | Bits | n/a | n/a | |  | |
| For Sub-Frame 0 | | Bits | 19680 | 18720 | |  | |
| Max. Throughput averaged over 1 frame | | Mbps | 4.7896 | 4.1240 | |  | |
| UE Category | |  | ≥ 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.45, 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. | | | | | | | |

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

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

## 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.20 | R.24 |
| Number of transmitter antennas |  | 1 | 2 | 4 | 1 |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 |
| User roles (Note 1) |  | 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) |
| Power offsets (Note 3) | dB | -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 |
| 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 |
| Number of transmitter antennas |  | 1 | 2 | 4 |
| Channel bandwidth | MHz | 1.4 | 1.4 | 1.4 |
| Modulation |  | QPSK | QPSK | QPSK |
| Target coding rate |  | 40/1920 | 40/1920 | 40/1920 |
| Payload (without CRC) | Bits | 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). | | | | | | | |

### 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)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 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 |  |  |  |  |  |  |  |  |
| 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 |
| For Sub-Frame 5 |  | 0.40 | 0.64 | 0.62 | 0.89 | 0.88 | 0.87 | 0.87 |
| For Sub-Frame 0 |  | 0.40 | 0.63 | 0.61 | 0.90 | 0.91 | 0.90 | 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 |
| 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) |  |  |  |  |  |  |  |  |
| 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 |
| 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 [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..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.3.9.2 TDD

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 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 |
| Modulation |  | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate |  |  |  |  |  |  |
| For Sub-Frames 4,9 |  | 0.40 | 0.59 | 0.59 | 0.87 | 0.88 |
| For Sub-Frames 3,7,8 |  | 0.40 | 0.59 | 0.59 | n/a | n/a |
| For Sub-Frames 1 |  | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frames 5 |  | 0.40 | 0.64 | 0.62 | 0.88 | 0.87 |
| For Sub-Frames 6 |  | 0.40 | 0.60 | 0.60 | n/a | n/a |
| For Sub-Frames 0 |  | 0.40 | 0.62 | 0.61 | 0.90 | 0.90 |
| Information Bit Payload |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 |
| For Sub-Frames 3,7,8 | Bits | 10296 | 25456 | 51024 | 0 | 0 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 51024 | 71112 |
| For Sub-Frame 6 | Bits | 10296 | 25456 | 51024 | 0 | 0 |
| 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 |  |  |  |  |  |  |
| For Sub-Frames 4,9 | Bits | 26100 | 43200 | 86400 | 58752 | 86400 |
| For Sub-Frames 3,7,8 | Bits | 26100 | 43200 | 86400 | 0 | 0 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 |
| 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 |
| 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.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.4-15 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.1 TDD | TDD | 10 | 50 | Note 3 |  | MCS.1 | 10 | 1 |  |
| RC.3 FDD | FDD | 10 | 6 | - |  | MCS.10 | 8 | 1 |  |
| RC.3 TDD | TDD | 10 | 6 | Note 3 |  | MCS.10 | 10 | 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 |  |
| **2 CRS Ports** | | | | | | | | | |
| RC.2 FDD | FDD | 10 | 50 | - |  | MCS.2 | 8 | 1 |  |
| RC.2 TDD | TDD | 10 | 50 | Note 3 |  | MCS.2 | 10 | 1 |  |
| RC.6 FDD | FDD | 10 | 15 | - |  | MCS.16 | 8 | 1 | Note 6 |
| RC.6 TDD | TDD | 10 | 15 | Note 3 |  | MCS.16 | 10 | 1 | Note 6 |
| **1 CRS Port + CSI-RS** | | | | | | | | | |
| RC.8 FDD | FDD | 10 | 6 | - | Non CSI-RS | MCS.11 | 8 | 1 |  |
| 2 CSI-RS | MCS.12 |
| RC.8 TDD | TDD | 10 | 6 | Note 3 | Non CSI-RS | MCS.11 | 10 | 1 |  |
| 2 CSI-RS | MCS.12 |
| RC.9 FDD | FDD | 10 | 50 | - | Non CSI-RS | MCS.3 | 8 | 1 |  |
| 2 CSI-RS | MCS.4 |
| RC.9 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.3 | 10 | 1 |  |
| 2 CSI-RS | MCS.4 |
| **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 |
| 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). | | | | | | | | | |

Table A.4-1a: Void

Table A.4-1b: Void

Table A.4-2: Void

Table A.4-2a: Void

Table A.4-2b: 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.4-4: Void

Table A.4-4a: Void

Table A.4-5: Void

Table A.4-5a: Void

Table A.4-6: Void

Table A.4-6a: Void

Table A.4-6b: 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: Void

Table A.14: Void

Table A.4-15: 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.3 | 50 | 5700 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 10 | 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.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 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 |  |
| 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 |  |
| 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. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions. | | | | | | | | | | | | | | | | | | | |

# 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.5.1.4 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.5.1.5 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.5.2 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. | | | | |

Annex B (normative):   
Propagation conditions

# B.1 Static propagation condition

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

Table B.2.2-1 shows propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies

Table B.2.2-1 Channel model parameters

|  |  |
| --- | --- |
| Model | Maximum Doppler frequency |
| EPA 5Hz | 5 Hz |
| EVA 5Hz | 5 Hz |
| EVA 70Hz | 70 Hz |
| ETU 30Hz | 30 Hz |
| ETU 70Hz | 70 Hz |
| ETU 300Hz | 300 Hz |

## 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 |
| **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 |
| **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** |  |
| **2x2 case** |  |
| **4x2 case** |  |
| **4x4 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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Low correlation | | Medium Correlation | | High Correlation | |
| α | β | α | β | α | β |
| 0 | 0 | 0.3 | 0.9 | 0.9 | 0.9 |

The correlation matrices for high, medium and low correlation are defined in Table B.2.3.1-2, B.2.3.2-3 and B.2.3.2-4,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 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 = 0.00012.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

|  |  |
| --- | --- |
| **1x2 case** |  |
| **2x2 case** |  |
| **4x2 case** |  |
| **4x4 case** |  |

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

|  |  |
| --- | --- |
| **1x2 case** | N/A |
| **2x2 case** |  |
| **4x2 case** |  |
| **4x4 case** |  |

Table B.2.3.2-4: MIMO correlation matrices for low correlation

|  |  |
| --- | --- |
| **1x2 case** |  |
| **2x2 case** |  |
| **4x2 case** |  |
| **4x4 case** |  |

In Table B.2.3.2-4, is the identity matrix.

## 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 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 high spatial correlation are given in Table B.2.3A.3-1.

Table B.2.3A.3-1

|  |  |  |
| --- | --- | --- |
| High spatial 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 are defined in Table B.2.3A.3-2 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

|  |  |
| --- | --- |
| 8x2 case |  |

### 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, which is ,

-  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 8 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.2.4 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.2.5 Void

## B.2.6 MBSFN Propagation Channel Profile

Table B.2.6-1 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: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment

|  |  |
| --- | --- |
| 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.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 for Band 7.



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.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  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 (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 , 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 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.

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 |
| 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

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.

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.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

|  |  |  |
| --- | --- | --- |
| 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 |
| 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 and σ are test specific.

NOTE 5: For TM 8 and TM 9 A, B are used for the purpose of the test set up only.

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 and TM9 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. | | | | |

Annex D (normative):   
Characteristics of the interfering signal

# D.1 General

When the channel band width is wider or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal and CW signal are used as interfering signals when RF performance requirements for E-UTRA UE receiver are defined. For channel band widths below 5MHz, the band width of modulated interferer should be equal to band width of the received signal.

# D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width 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 |

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

Note: this annex applies for single carrier and in case of carrier aggregation for the component carrier, with PRBs allocated.

# 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 signal under test is modified and, in the case of PUSCH data signal, decoded according to::



where

 is the time domain samples of the signal under test.

The PUCCH or PUSCH 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, 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.6 Averaged EVM

The general EVM is averaged over basic EVM measurements for 20 slots in the time domain.



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.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 |  |  | TBD |
| 23 |  |  |  | TBD |  |  | FDD |
| 24 |  |  |  | [-102] |  |  | 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 |
| 41 |  |  |  | [-102] |  |  | TDD |
| 42 |  |  |  | [-102] |  |  | TDD |
| 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 |
| 21 |  |  |  | [6]1 |  |  | FDD |
| 22 |  |  |  | [6]1 |  |  | FDD |
| 23 |  |  |  | [6]1 |  |  | FDD |
| 24 |  |  |  | [6]1 |  |  | 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 |
| 41 |  |  |  | 50 |  |  | TDD |
| 42 |  |  |  | 50 |  |  | TDD |
| 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).  2. For the UE which supports both Band 11 and Band 21 the minimum uplink configuration for reference sensitivity is FFS.  4. 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 | | | | | | | |

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

|  |  |
| --- | --- |
| E-UTRA Band | Network Signalling value |
| 2 | NS\_03 |
| 4 | NS\_03 |
| 10 | NS\_03 |
| 12 | NS\_06 |
| 13 | NS\_06 |
| 14 | NS\_06 |
| 17 | NS\_06 |
| 19 | NS\_08 |
| 21 | NS\_09 |
| 23 | NS\_03 |
| 24 | NS\_56 |
| 35 | NS\_03 |
| 36 | NS\_03 |

# 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 |  |  |  | 10 |  |  |
| Allocated resource blocks |  |  |  |  | 50 |  |  |
| Subcarriers per resource block |  |  |  |  | 12 |  |  |
| Allocated subframes per Radio Frame |  |  |  |  | 10 |  |  |
| Modulation |  |  |  |  | QPSK |  |  |
| Target Coding Rate |  |  |  |  | 1/3 |  |  |
| Number of HARQ Processes | Processes |  |  |  | 8 |  |  |
| Maximum number of HARQ transmissions |  |  |  |  | [4] |  |  |
| Information Bit Payload per Sub-Frame |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  |  | 4392 |  |  |
| For Sub-Frame 5 | Bits |  |  |  | n/a |  |  |
| For Sub-Frame 0 | Bits |  |  |  | 4392 |  |  |
| Transport block CRC | Bits |  |  |  | 24 |  |  |
| Number of Code Blocks per Sub-Frame (Note 4) |  |  |  |  |  |  |  |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits |  |  |  | 1 |  |  |
| For Sub-Frame 5 | Bits |  |  |  | n/a |  |  |
| For Sub-Frame 0 | Bits |  |  |  | 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 | kbps |  |  |  | 3952.8 |  |  |
| UE Category |  |  |  |  | 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 can 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 can 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 can be set to 1 by a power class 3 UE supporting A-MPR associated to NS\_04 for Band 41. |

Annex I (informative):   
Change history

Table H-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 |
| 06-2012 | RP-56 | RP-120777 | 1086r1 |  |  | Carrier aggregation Relative power tolerance, removal of TBD. | 10.7.0 |
| 06-2012 | RP-56 | RP-120783 | 1088 |  |  | UE spurious emissions for Band 7 and Band 38 coexistence | 10.7.0 |
| 06-2012 | RP-56 | RP-120780 | 1091 |  |  | Deleting square brackets in Reference Measurement Channels | 10.7.0 |
| 06-2012 | RP-56 | RP-120773 | 1093 |  |  | Addition of Maximum Throughput for R.30-1 TDD RMC | 10.7.0 |
| 06-2012 | RP-56 | RP-120779 | 1095 |  |  | CR to TS36.101: Correction on parameters for the eDL-MIMO CQI and PMI tests | 10.7.0 |
| 06-2012 | RP-56 | RP-120780 | 1096r1 |  |  | 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 | 10.7.0 |
| 06-2012 | RP-56 | RP-120779 | 1100r1 |  |  | CR for 36.101: The clarification of MPR and A-MPR for CA | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1101 |  |  | Corrections for eICIC demod test case with MBSN ABS | 10.7.0 |
| 06-2012 | RP-56 | RP-120774 | 1106 |  |  | RMC correction on eDL-MIMO RI test | 10.7.0 |
| 06-2012 | RP-56 | RP-120774 | 1109r1 |  |  | FRC correction on frequency selective CQI and PMI test (Rel-10) | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1110r1 |  |  | Corrections and clarifications on eICIC demodulation tests | 10.7.0 |
| 06-2012 | RP-56 | RP-120774 | 1113 |  |  | Correction on test point for PMI test (Rel-10) | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1116r1 |  |  | Corrections and clarifications on eICIC CSI tes | 10.7.0 |
| 06-2012 | RP-56 | RP-120783 | 1118r1 |  |  | Corrections on UE performance requirements | 10.7.0 |
| 06-2012 | RP-56 | RP-120769 | 1126r1 |  |  | Addition of ETU30 channel model | 10.7.0 |
| 06-2012 | RP-56 | RP-120779 | 1129r1 |  |  | CR for EVM and global in channel test for Intra-Band CA | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1146r1 |  |  | Extension of static eICIC CQI test | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1148r2 |  |  | Introduction of PDCCH test with colliding RS on MBSFN-ABS | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1152r2 |  |  | Some clarifications and OCNG pattern for eICIC demodulation requirements | 10.7.0 |
| 06-2012 | RP-56 | RP-120773 | 1154 |  |  | Introduction of TDD CA Soft Buffer Limitation | 10.7.0 |
| 06-2012 | RP-56 | RP-120779 | 1160 |  |  | Corrections on CQI and PMI test | 10.7.0 |
| 06-2012 | RP-56 | RP-120780 | 1162 |  |  | FRC for TDD PMI test | 10.7.0 |
| 06-2012 | RP-56 | RP-120778 | 1164r1 |  |  | Clean-up of UL-MIMO for TS36.101 | 10.7.0 |
| 06-2012 | RP-56 | RP-120782 | 1168r1 |  |  | SNR definition | 10.7.0 |
| 06-2012 | RP-56 | RP-120782 | 1170 |  |  | Removal of unnecessary references to single carrier requirements from Interband CA sub-clauses | 10.7.0 |
| 06-2012 | RP-56 | RP-120780 | 1172 |  |  | Editorial simplification to CA REFSENS UL allocation table | 10.7.0 |
| 06-2012 | RP-56 | RP-120781 | 1173 |  |  | PDCCH wrong detection in receiver spurious emissions test | 10.7.0 |
| 06-2012 | RP-56 | RP-120776 | 1183 |  |  | Corrections to 3500 MHz | 10.7.0 |
| 06-2012 | RP-56 | RP-120784 | 1192r1 |  |  | Target SNR setting for eICIC demodulation requirement | 10.7.0 |
| 06-2012 | RP-56 | RP-120778 | 1198 |  |  | Correction of wrong table refernces in CA receiver tests | 10.7.0 |
| 06-2012 | RP-56 | RP-120782 | 1201r2 |  |  | SNR reference values for FDD CA soft buffer tests | 10.7.0 |
| 06-2012 | RP-56 | RP-120764 | 1211 |  |  | Correction of PHS protection requirements for TS 36.101 | 10.7.0 |
| 06-2012 | RP-56 | RP-120781 | 1214r1 |  |  | Proposed revision of subclause 4.3A for TS36.101 | 10.7.0 |
| 06-2012 | RP-56 | RP-120781 | 1216r1 |  |  | Proposed revision on subclause 6.3.4A for TS36.101 | 10.7.0 |
| 06-2012 | RP-56 | RP-120778 | 1222 |  |  | Correction of CSI configuraiton for CA TM4 tests R10 | 10.7.0 |
| 06-2012 | RP-56 | RP-120773 | 1224 |  |  | CR on CA UE receiver timing window R10 | 10.7.0 |
| 09-2012 | RP-57 | RP-121294 | 1229 |  |  | Correct Transport Block size in 9RB 16QAM Uplink Reference Measurement Channel | 10.8.0 |
| 09-2012 | RP-57 | RP-121313 | 1232r1 |  |  | RF: Corrections to power allocation parameters for transmission mode 8 | 10.8.0 |
| 09-2012 | RP-57 | RP-121304 | 1234 |  |  | RF-CA: non-CA notation and applicability of test points in scenarios without and with CA operation | 10.8.0 |
| 09-2012 | RP-57 | RP-121305 | 1236 |  |  | ACK/NACK feedback modes for FDD and TDD TM4 CA demodulation requirements (Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121305 | 1238 |  |  | Correction of feedback mode for CA TDD demodulation requirements (resubmission of R4-63AH-0194 for Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121302 | 1240 |  |  | ABS pattern setup for MBSFN ABS test (resubmission of R4-63AH-0204 for Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121302 | 1242 |  |  | CR on eICIC CQI definition test (resubmission of R4-63AH-0205 for Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121302 | 1244r1 |  |  | Transmission of CQI feedback and other corrections (Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121302 | 1246r1 |  |  | Target SNR setting for eICIC MBSFN-ABS demodulation requirements (Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121300 | 1250 |  |  | Corrections of spurious emission band UE co-existence applicable in Japan | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1252 |  |  | Correction on RMC for frequency non-selective CQI test | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1254r1 |  |  | Requirements for the eDL-MIMO CQI test | 10.8.0 |
| 09-2012 | RP-57 | RP-121302 | 1256r1 |  |  | Clarification on PDSCH test setup under MBSFN ABS | 10.8.0 |
| 09-2012 | RP-57 | RP-121313 | 1261r1 |  |  | Applicabilty of statement allowing RBW < Meas BW for spurious | 10.8.0 |
| 09-2012 | RP-57 | RP-121298 | 1264 |  |  | Clarification of RB allocation for DRS demodulation tests | 10.8.0 |
| 09-2012 | RP-57 | RP-121304 | 1266r1 |  |  | Removal of brackets for CA Tx | 10.8.0 |
| 09-2012 | RP-57 | RP-121313 | 1270 |  |  | Corrections of FRC subframe allocations and other minor problems | 10.8.0 |
| 09-2012 | RP-57 | RP-121305 | 1272 |  |  | Adding missed code rate of R.35-1 TDD for R10 | 10.8.0 |
| 09-2012 | RP-57 | RP-121305 | 1273r1 |  |  | Introduction of requirements for TDD CA Soft Buffer Limitation | 10.8.0 |
| 09-2012 | RP-57 | RP-121307 | 1275r1 |  |  | Correction of eDL-MIMIO CSI RMC tables and references | 10.8.0 |
| 09-2012 | RP-57 | RP-121307 | 1277 |  |  | Correction of MIMO channel model for polarized antennas | 10.8.0 |
| 09-2012 | RP-57 | RP-121303 | 1279r1 |  |  | Addition of 15 and 20MHz Bandwidths for Band 23 to TS 36.101 (Rel-10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121304 | 1284r1 |  |  | CR for A-MPR masks for NS\_CA\_1C | 10.8.0 |
| 09-2012 | RP-57 | RP-121446 | 1287r2 |  |  | Introduction of Japanese Regulatory Requirements to LTE Band 8(R10) | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1297r1 |  |  | Requirements for eDL-MIMO RI test | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1303 |  |  | Corrections to TM9 demodulation tests | 10.8.0 |
| 09-2012 | RP-57 | RP-121313 | 1305 |  |  | Correction to PCFICH power parameter setting | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1308r1 |  |  | Correction on frequency non-selective CQI test | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1311r1 |  |  | eDL-MIMO CQI/PMI test | 10.8.0 |
| 09-2012 | RP-57 | RP-121313 | 1315 |  |  | Correction of the definition of unsynchronized operation | 10.8.0 |
| 09-2012 | RP-57 | RP-121304 | 1319r1 |  |  | Correction to Transmit Modulation Quality Tests for Intra-Band CA | 10.8.0 |
| 09-2012 | RP-57 | RP-121304 | 1331r1 |  |  | Bandwidth combination sets for intra-band and inter-band carrier aggregation | 10.8.0 |
| 09-2012 | RP-57 | RP-121306 | 1349r1 |  |  | FRC for TM9 FDD | 10.8.0 |
| 09-2012 | RP-57 | RP-121295 | 1350 |  |  | Random precoding granularity in PMI tests | 10.8.0 |
| 09-2012 | RP-57 | RP-121302 | 1357 |  |  | Introduction of RI test for eICIC | 10.8.0 |
| 09-2012 | RP-57 | RP-121304 | 1359 |  |  | Notes for deltaTib and deltaRib tables | 10.8.0 |
| 12-2012 | RP-58 | RP-121861 | 1365r1 |  |  | Some changes related to CA tests and overview table of DL measurement channels | 10.9.0 |
| 12-2012 | RP-58 | RP-121860 | 1367 |  |  | Correction of eICIC CQI tests | 10.9.0 |
| 12-2012 | RP-58 | RP-121860 | 1369 |  |  | Correction of eICIC demodulation tests | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1372r1 |  |  | Correction of SNR definition | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1373 |  |  | Correction on CSI-RS subframe offset parameter | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1375r1 |  |  | Correction on FRC table in CSI test | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1381 |  |  | Correction of reference channel table for TDD eDL-MIMIO RI test | 10.9.0 |
| 12-2012 | RP-58 | RP-121850 | 1385 |  |  | OCNG patterns for Sustained Data rate testing | 10.9.0 |
| 12-2012 | RP-58 | RP-121867 | 1387r1 |  |  | Introduction of one periodic CQI test for CA deployments | 10.9.0 |
| 12-2012 | RP-58 | RP-121850 | 1400 |  |  | Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 | 10.9.0 |
| 12-2012 | RP-58 | RP-121860 | 1403 |  |  | CR on eICIC RI test | 10.9.0 |
| 12-2012 | RP-58 | RP-121861 | 1404 |  |  | Correction of some errors in reference sensitivity for CA in TS 36.101 (R10) | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1408r1 |  |  | Cleaning of 36.101 Performance sections Rel-10 | 10.9.0 |
| 12-2012 | RP-58 | RP-121861 | 1415r1 |  |  | Out-of-band blocking requirements for inter-band carrier aggregation | 10.9.0 |
| 12-2012 | RP-58 | RP-121860 | 1417r1 |  |  | Brackets clean up for eICIC CSI/demodulation | 10.9.0 |
| 12-2012 | RP-58 | RP-121867 | 1430 |  |  | Clean up of specification R10 | 10.9.0 |
| 12-2012 | RP-58 | RP-121867 | 1435r1 |  |  | Band 1 to Band 33 and Band 39 UE coexistence requirements | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1441 |  |  | Correction of eDL-MIMO RI test and RMC table for the CSI test | 10.9.0 |
| 12-2012 | RP-58 | RP-121861 | 1443 |  |  | Minor correction to ceiling function example - rel10 | 10.9.0 |
| 12-2012 | RP-58 | RP-121860 | 1454r1 |  |  | CR on eICIC RI testing (Rel-10) | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1458 |  |  | Correction on FRC table | 10.9.0 |
| 12-2012 | RP-58 | RP-121862 | 1463 |  |  | Adding references to the appropriate beamforming model (Rel-10) | 10.9.0 |
| 12-2012 | RP-58 | RP-121866 | 1466 |  |  | Maintenance of Band 23 UE Coexistence | 10.9.0 |
| 12-2012 | RP-58 | RP-121849 | 1493 |  |  | Low-channel Band 1 coexistence with PHS | 10.9.0 |
| 12-2012 | RP-58 | RP-121852 | 1508 |  |  | UE-UE coexistence between bands with small frequency separation | 10.9.0 |
| 12-2012 | RP-58 | RP-121860 | 1512 |  |  | Applicable OFDM symbols of Noc\_2 for PDCCH/PCFICH ABS-MBSFN test cases | 10.9.0 |
| 12-2012 | RP-58 | RP-121851 | 1514 |  |  | Corrections to TM4 rank indicator Test 3 | 10.9.0 |
| 12-2012 | RP-58 | RP-121861 | 1516 |  |  | Correction of test configuraitons and FRC for CA demodulation with power imbalance | 10.9.0 |
| 03-2013 | RP-59 | RP-130268 | 1522 |  |  | Brackets removal in Rel-10 TM4 rank indicator Test 3 | 10.10.0 |
| 03-2013 | RP-59 | RP-130258 | 1527 |  |  | Corrections to CQI reporting | 10.10.0 |
| 03-2013 | RP-59 | RP-130264 | 1533r2 |  |  | CR for CA performance requirements | 10.10.0 |
| 03-2013 | RP-59 | RP-130262 | 1535 |  |  | Corrections for eICIC performance requirements (rel-10) | 10.10.0 |
| 03-2013 | RP-59 | RP-130264 | 1538 |  |  | Correction of CA power imbalance performance requirements | 10.10.0 |
| 03-2013 | RP-59 | RP-130263 | 1542r3 |  |  | Clarification of spurious emission domain for CA in TS 36.101 (R10) | 10.10.0 |
| 03-2013 | RP-59 | RP-130263 | 1556r1 |  |  | CA\_1C: CA\_NS\_02 and CA\_NS\_03 A-MPR REL-10 | 10.10.0 |
| 03-2013 | RP-59 | RP-130267 | 1561r1 |  |  | Addition of UE Regional Requirements to Band 23 Based on New Regulatory Order in the US | 10.10.0 |
| 03-2013 | RP-59 | RP-130260 | 1573 |  |  | Remove [ ] from CSI test case parameters | 10.10.0 |
| 03-2013 | RP-59 | RP-130268 | 1578 |  |  | UE-UE co-existence between Band 1 and Band 33/39 | 10.10.0 |
| 03-2013 | RP-59 | RP-130263 | 1583r1 |  |  | Cleanup for CA UE RF requirements | 10.10.0 |
| 03-2013 | RP-59 | RP-130263 | 1585 |  |  | Corrections on UL configuration for CA UE receiver requirements | 10.10.0 |
| 03-2013 | RP-59 | RP-130263 | 1587 |  |  | Correction of Transmit modulation quality requirements for CA | 10.10.0 |
| 03-2013 | RP-59 | RP-130268 | 1589 |  |  | Revision of Common Test Parameters for User-specific Demodulation Tests | 10.10.0 |
| 03-2013 | RP-59 | RP-130264 | 1596 |  |  | Correction of CA CQI test setup | 10.10.0 |
| 03-2013 | RP-59 | RP-130263 | 1601 |  |  | Correction of table reference | 10.10.0 |
| 06-2013 | RP-60 | RP-130765 | 1603 |  |  | Complementary description for definition of MIMO Correlation Matrices using cross polarized antennas | 10.11.0 |
| 06-2013 | RP-60 | RP-130763 | 1606 |  |  | Correction of transport format parameters for CQI index 10 (15 RBs) - Rel 10 | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1609 |  |  | Maintenance of Band 23 A-MPR (NS\_11) in TS 36.101 (Rel-10) | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1622r1 |  |  | Correction of test parameters for eICIC performance requirements | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1624 |  |  | Correction of test parameters for eICIC CSI requirements | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1626r1 |  |  | Correction of resource allocation for the multiple PMI Cat 1 UE test | 10.11.0 |
| 06-2013 | RP-60 | RP-130767 | 1630 |  |  | Minor correction for CA CQI test setup | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1655r1 |  |  | Modification of configured output power to account for larger tolerance | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1680r1 |  |  | Correction for TS 36.101 | 10.11.0 |
| 06-2013 | RP-60 | RP-130763 | 1683 |  |  | RF: Corrections to RMC-s for sustained data rate test | 10.11.0 |
| 06-2013 | RP-60 | RP-130766 | 1688 |  |  | Carrier aggregation in multi RAT and multiple band combination terminals | 10.11.0 |
| 06-2013 | RP-60 | RP-130766 | 1690r1 |  |  | Completion of out-of-band blocking requirements for inter-band CA with one UL | 10.11.0 |
| 06-2013 | RP-60 | RP-130767 | 1694r1 |  |  | CR on the bandwidth coverage issue of CA demodulation performance (Rel-10) | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1696r1 |  |  | Correction on UE maximum output power for intra-band CA (R10) | 10.11.0 |
| 06-2013 | RP-60 | RP-130767 | 1702 |  |  | CR on the bandwidth coverage issue of CA CQI performance(Rel-10) | 10.11.0 |
| 06-2013 | RP-60 | RP-130766 | 1704 |  |  | Corrections to ACLR for Rel-10 CA | 10.11.0 |
| 06-2013 | RP-60 | RP-130770 | 1708 |  |  | Corrections for co-existence(Rel-10) | 10.11.0 |
| 06-2013 | RP-60 | RP-130765 | 1715 |  |  | Corrections to NS\_11 A-MPR Table | 10.11.0 |
| 09-2013 | RP-61 | RP-131281 | 1734 |  |  | CR on applicability of CA sustained data rate tests (Rel-10) | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1737 |  |  | Correction of the CA capabilities for the soft buffer tests (Rel-10) | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1759r1 |  |  | Correction of the missing frequency range for B7 UE co-existence requirements in R10 | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1765 |  |  | UE REFSENS when supporting intra-band CA and inter-band CA | 10.12.0 |
| 09-2013 | RP-61 | RP-131279 | 1770 |  |  | Correlation matrix for high speed train demodulation scenarios (Rel-10) | 10.12.0 |
| 09-2013 | RP-61 | RP-131280 | 1774 |  |  | Corrections to sustained data rate test (Rel-10) | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1792r1 |  |  | Clarification of “multi-cluster” transmission | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1798r1 |  |  | CA UE Coexistence Table update (Release 10) | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1805 |  |  | Incorrect REFSENS UL allocation for CA\_1C | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1809 |  |  | Contiguous intraband CA REFSENS with one UL | 10.12.0 |
| 09-2013 | RP-61 | RP-131281 | 1817 |  |  | Correction to Rel-10 A-MPR for CA\_NS\_04: This CR is NOT implemented as it is based on a wrong version of the Spec |  |
| 09-2013 | RP-61 | RP-131281 | 1818r1 |  |  | The Pcmax clauses restructured | 10.12.0 |
| 12-2013 | RP-62 | RP-131928 | 1845r1 |  |  | Corrections to the notes in the band UE co-existence requirements table (Rel-10) | 10.13.0 |
| 12-2013 | RP-62 | RP-131924 | 1850 |  |  | Clean-up of uplink reference measurement channels (Rel-10) | 10.13.0 |
| 12-2013 | RP-62 | RP-131928 | 1875r2 |  |  | Intraband CA channel bandwidth combination table restructuring | 10.13.0 |
| 12-2013 | RP-62 | RP-131926 | 1902 |  |  | Correction on the UE category for eICIC CQI test | 10.13.0 |
| 12-2013 | RP-62 | RP-131928 | 1914r2 |  |  | Allowed power reductions for multiple transmissions in a subframe | 10.13.0 |
| 12-2013 | RP-62 | RP-131927 | 1920 |  |  | CR on correction of FRC of power imbalance test | 10.13.0 |
| 12-2013 | RP-62 | RP-131927 | 1935 |  |  | UE-UE coexistence for Band 40 | 10.13.0 |
| 12-2013 | RP-62 | RP-131927 | 1943 |  |  | CR Removing Addition of DTc to P-MPR | 10.13.0 |
| 12-2013 | RP-62 | RP-131928 | 1982r1 |  |  | Correction to blocking requirements and use of Delta\_Rib | 10.13.0 |
| 12-2013 | RP-62 | RP-131924 | 2012 |  |  | P-max for Band 38 to Band 7 coexistence | 10.13.0 |
| 12-2013 | RP-62 | RP-131928 | 2033r1 |  |  | Nominal guard bands for CA bandwidth classes A and C | 10.13.0 |
| 12-2013 | RP-62 | RP-131926 | 2038 |  |  | CA\_1C: Correction on CA\_NS\_02 A-MPR table | 10.13.0 |
| 12-2013 | RP-62 | RP-131924 | 2063 |  |  | Simplification of Band 12/17 in-band blocking test cases  CR was not implemented as it was not based on the latest version of the spec | 10.13.0 |
| 03-2014 | RP-63 | RP-140368 | 2090 |  |  | CR for structure change of CA soft buffer tests in Rel-10 | 10.14.0 |
| 03-2014 | RP-63 | RP-140368 | 2087r1 |  |  | CR for introduction of15MHz based SDR tests and test point table in Rel-10 | 10.14.0 |
| 03-2014 | RP-63 | RP-140368 | 2145 |  |  | Correction of coding rate for 18RBs in UL RMC table | 10.14.0 |
| 03-2014 | RP-63 | RP-140368 | 2135 |  |  | Configured transmitted power for CA | 10.14.0 |
| 03-2014 | RP-63 | RP-140368 | 2120 |  |  | CR for 36.101. Editorial correction on OCNG pattern | 10.14.0 |
| 06-2014 | RP-64 | RP-140911 | 2231 |  |  | Clarification of Intra-band contiguous CA class C Narrow band blocking requirements | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2267r1 |  |  | Additional correction to In-band blocking case nubering re-establisment | 10.15.0 |
| 06-2014 | RP-64 | RP-140909 | 2300r3 |  |  | RF: Corrections to spurious emission requirements with NS different than NS\_01 (Rel-10) | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2312r2 |  |  | UE to UE co-existence between B42/B43 | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2316 |  |  | Perf: Corrections to CA (Class C) performance with power imbalance (Rel-10) | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2326 |  |  | Clean-up CR for demodulation requirements (Rel-10) | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2331 |  |  | Throughput calculation for eICIC demodulation requirements | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2339 |  |  | Cleanup of terminology for Rx requirements | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2342 |  |  | CR on separating CA UE demodulation tests from single carrier tests in Rel-10 | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2345 |  |  | CR on correction on CA capability in Rel-10 | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2349 |  |  | Test configuration for intra-band contiguous carrier aggregation power control | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2363 |  |  | Clarification on CA bandwidth classes | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2364 |  |  | Clarification on CA bandwidth classes | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2365 |  |  | Clarification on CA bandwidth classes | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2375 |  |  | Corrections on CA CQI tests | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2389 |  |  | CR on PDSCH transmission for eICIC CSI requirements (Rel-10) | 10.15.0 |
| 06-2014 | RP-64 | RP-140911 | 2426 |  |  | Simplification of Band 12/17 in-band blocking test cases | 10.15.0 |
| 09-2014 | RP-65 | RP-141525 | 2502 |  |  | Perf: Cleanup and better description of DL-RMC-s with dynamic coding rate for CSI requirements (Rel-10) | 10.16.0 |
| 09-2014 | RP-65 | RP-141525 | 2563 |  |  | Corrections to UE coex table | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2432 |  |  | Correction on support of a bandwidth combination set | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2451 |  |  | Remove the invalid TDD single-antenna test and maintenance of applicability table for CA sustained data rate test (Rel-10) | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2464 |  |  | Unequal DL CC RB allocations in Maximum input level | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2467 |  |  | Intra-band contiguous CA ACS case 2 test clarification | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2476 |  |  | CQI reporting under fading: CQI indices in set | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2482r1 |  |  | Corrections on delta Tc for UE MOP for intra-band contiguous CA | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2485 |  |  | Removal of Class B in UE TX requirement | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2514r1 |  |  | CR for CA applicability rule in 36.101 in Rel-10 | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2517 |  |  | Editorial CR for CA performance tests in 36.101 in Rel-10 | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2520 |  |  | CR on CA power imbalance tests in Rel-10 | 10.16.0 |
| 09-2014 | RP-65 | RP-141527 | 2546 |  |  | Correction to NS\_20 A-MPR for Band 23 | 10.16.0 |
| 12-2014 | RP-66 | RP-142144 | 2577 |  |  | Correction on out-of-band blocking for intra-band CA | 10.17.0 |
| 12-2014 | RP-66 | RP-142142 | 2585 |  |  | CR for 1 PRB allocation performance in presence of MBSFN (rel-10) | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2588 |  |  | Maintenance of CA demodulation performance requirements (Rel-10) | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2635 |  |  | Defintion of the bits in the bitmap for indication of modified MPR behavior | 10.17.0 |
| 12-2014 | RP-66 | RP-142147 | 2618r1 |  |  | CQI reporting in AWGN: CQI indices in set | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2572r1 |  |  | CR for REFSENSE in lower SNR and change history | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2686 |  |  | Removal of bracket for UL MIMO | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2698 |  |  | Delete the incorrect notes for FDD DMRS demodulation tests (Rel-10) | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2718 |  |  | Band 22 correction in UE to UE co-existance table. | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2748 |  |  | Correction to Transmit Modulation Quality for CA | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2674r1 |  |  | CR to remove CA capability column in CA performance test tables (Rel-10) | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2725r1 |  |  | CR for CA applicability rule in 36.101 in Rel-10 | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2708r1 |  |  | Clarification of UL and DL CA configuration | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2715r1 |  |  | Clarification of notes relating to interferer offsets in intrabnd CA receiver requirement tables. | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2756 |  |  | Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2749r1 |  |  | Removal of brackets and TBD from CA feature | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2695r1 |  |  | Maintenance of CA performance requirements (Rel-10) | 10.17.0 |
| 12-2014 | RP-66 | RP-142144 | 2702r2 |  |  | UE to UE co-existence between B42/B43 | 10.17.0 |
| 03-2015 | RP-67 | RP-150382 | 2795 |  |  | UL HARQ in PDSCH and PDCCH/PCFICH demod test cases for eICIC with MBSFN ABS | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2798 |  |  | Correction to eICIC aggressor cell configurations | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2803 |  |  | Removal of eDL-MIMO term from specification | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2817 |  |  | UE to UE co-existence between B42/B43 | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2820 |  |  | Corrections to CA in-band emissions requirement | 10.18.0 |
| 03-2015 | RP-67 | RP-150381 | 2828 |  |  | Uplink RMCs for sustained data rate test | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2831 |  |  | Corrections to the CA power imbalance test | 10.18.0 |
| 03-2015 | RP-67 | RP-150392 | 2840 |  |  | Editorial CR for CA UE performance tests in 36.101 in Rel-10 | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2845 |  |  | UE spurious emissions structure correction for CA | 10.18.0 |
| 03-2015 | RP-67 | RP-150382 | 2848r1 |  |  | Removal of Pcmax requirements for UL inter-band CA in early release | 10.18.0 |
| 07-2015 | RP-68 | RP-150954 | 2868 |  |  | Intra-band contiguous CA reference sensitivity definition for Class D | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 2899 |  |  | UE to UE co-existence between B42/B43 | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 2929r1 |  |  | 3.5 GHz out-of-band blocking | 10.19.0 |
| 07-2015 | RP-68 | RP-150958 | 2945 |  |  | Updates to the definitions of CA capability (Rel-10) | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 2954r1 |  |  | NS value for intra-band contiguous CA configurations not allowed A-MPR | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 2969r1 |  |  | Corrections to NS\_22 and NS\_23 | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 2990 |  |  | Clarification to spurious emission requirement for the edge of spurious domain | 10.19.0 |
| 07-2015 | RP-68 | RP-150958 | 3000 |  |  | CR for updating CA applicability rule in 36.101 in Rel-10 | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 3014r1 |  |  | Clarification to Inter-band CA test configuration requirement | 10.19.0 |
| 07-2015 | RP-68 | RP-150954 | 3015 |  |  | EVM for Intra-band contiguous UL CA for non-equal Channel BWs | 10.19.0 |
| 09-2015 | RP-69 | RP-151475 | 3037 |  |  | Correction to RI test parameters in TS 36.101 (Rel-10) | 10.20.0 |
| 09-2015 | RP-69 | RP-151483 | 3047 |  |  | UE co-existence requirements between Band 42 and Japanese bands | 10.20.0 |
| 09-2015 | RP-69 | RP-151475 | 3073 |  |  | Correction to PDCCH/PCFICH test parameters in TS 36.101 (Rel-10) | 10.20.0 |
| 09-2015 | RP-69 | RP-151475 | 3077 |  |  | Correction to PMI delay in PMI test for TDD | 10.20.0 |
| 09-2015 | RP-69 | RP-151475 | 3099 |  |  | Correction on UE maximum output power class of Band 22 for UL MIMO | 10.20.0 |
| 09-2015 | RP-69 | RP-151475 | 3162 |  |  | Correction of applicability of CA\_NS\_31 | 10.20.0 |
| 12-2015 | RP-70 | RP-152131 | 3168a |  |  | Corrections to applicability of CSI requirements for low UE categories (Rel-10) | 10.21.0 |
| 12-2015 | RP-70 | RP-152130 | 3199r1 |  |  | CR: Removal of 1.4MHz MBMS test (Rel-10) | 10.21.0 |
| 12-2015 | RP-70 | RP-152130 | 3229 |  |  | Correction to reference channel for CQI requirements | 10.21.0 |
| 12-2015 | RP-70 | RP-152131 | 3266r1 |  |  | Clarification of Pcell support in 36.101 Rel-11 in CA scenarios | 10.21.0 |
| 12-2015 | RP-70 | RP-152131 | 3282 |  |  | Missing RB allocation and OCNG Pattern for Cat 1 UEs in Multiple PMI CSI Reference Symbol tests | 10.21.0 |
| 03/2016 | RP-71 | RP-160487 | 3470 |  | D | CR of editorial change on PHICH group and Ng in Rel-10 | 10.22.0 |
| 03/2016 | RP-71 | RP-160487 | 3400 | 1 | F | [Rel-10] NS\_05 modification for PHS protection in Japan | 10.22.0 |
| 09/2016 | RP-73 | RP-161632 | 3652 |  | F | Improving the single antenna port description in UL-MIMO clauses | 10.23.0 |
| 09/2016 | RP-73 | RP-161632 | 3795 |  | F | Correction of OCNG (Rel-10) | 10.23.0 |
| 12/2016 | RP-74 | RP-162411 | 4018 |  | F | RMCs and applicabilility of core RF requirements | 10.24.0 |
| 12/2016 | RP-74 | RP-162411 | 4027 |  | F | Correction of spurious emissions requirements for Band 9 range and intra-band CA | 10.24.0 |
| 12/2016 | RP-74 | RP-162406 | 4098 |  | F | Versioning indicator bit for NS\_04 A-MPR table | 10.24.0 |
| 01/2017 | RP-74 |  |  |  |  | Update of the page header information | 10.24.1 |
| 09/2017 | RP-77 | RP-171965 | 4519 | 2 | F | Correction of band 43 spurious emissions limit (Rel-10) | 10.25.0 |
| 09/2017 | RP-77 | RP-171964 | 4593 |  | A | Correction for EPA delay profiles of r.m.s delay spread (Rel-10) | 10.25.0 |
| 2018-03 | RAN#79 | RP-180285 | 4942 |  | F | PC2 for CA\_41C REL-10 | 10.26.0 |
| 2018-06 | RAN#80 | RP-181105 | 5016 | 1 | F | Cat.F CR for UE-to-UE co-existence for Band 3 in Japan (Rel-10) | 10.27.0 |
| 2018-06 | RAN#80 | RP-181106 | 5046 | 2 | F | CR: Corrections for CSI tests (Rel-10) | 10.27.0 |
| 2018-09 | RAN#81 | RP-181908 | 5185 | 1 | F | Correction on Table 7.3.1-3 Network signalling value for reference sensitivity | 10.28.0 |
| 2021-03 | RAN#91 | RP-210111 | 5714 | 1 | F | CR for 36.101: Corrections related to Band 24 regulatory updates | 10.29.0 |
| 2021-06 | RAN#92 | RP-211092 | 5751 | 1 | F | CR for updates related to LTE band 24 in 36.101 (Rel-10) | 10.30.0 |
| 2021-09 | RAN#93 | RP-211920 | 5801 |  | F | CR for updates related to LTE band 24 in 36.101 (Rel-10) | 10.31.0 |
| 2021-12 | RAN#94 | RP-212844 | 5823 |  | F | CR to clarify default Tx-Rx spacing for LTE band 24 | 10.32.0 |
| 2022-09 | RAN#97 | RP-222023 | 5881 |  | F | Big CR for 36.101 maintenance (Rel-10) | 10.33.0 |