**3GPP TSG-RAN WG4 Meeting #97-e R4-2016787**

**Electronic Meeting, 2-13 Nov. 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-2** | **CR** | **0306** | **rev** | **1** | **Current version:** | **15.11.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | CR to DMRS position in UL RMC for FR2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2020-11-02 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-15 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | A definition of ‘DFT-s-OFDM Symbols per Slot’ and ‘CP-OFDM Symbols per slot’ in UL RMC Tables in A.2 of the current spec is misleading. It should be clarified that it excludes the number of DM-RS symbols in the slot. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Added a note clarifying its definition to the Tables. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Test cases might be implemented in 3GPP spec non-compliant way. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | |  | | |
| ***affected:*** | | **x** |  | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### <Start of Change 1>

### A.2.3.1 DFT-s-OFDM Pi/2-BPSK

Table A.2.3.1-1: Reference Channels for DFT-s-OFDM pi/2-BPSK for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 50-200 | 60 | 16 | 11 | pi/2 BPSK | 0 | 1/4 | 480 | 16 | 2 | 1 | 2024 | 2024 |
|  | 50 | 60 | 32 | 11 | pi/2 BPSK | 0 | 1/4 | 1032 | 16 | 2 | 1 | 4224 | 4224 |
|  | 50 | 60 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 100 | 60 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 100 | 60 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 200 | 60 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 200 | 60 | 256 | 11 | pi/2 BPSK | 0 | 1/4 | 7944 | 24 | 2 | 3 | 33792 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.1-2: Reference Channels for DFT-s-OFDM pi/2-BPSK for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 50 | 120 | 16 | 11 | pi/2 BPSK | 0 | 1/4 | 504 | 16 | 2 | 1 | 2112 | 2112 |
|  | 50 | 120 | 32 | 11 | pi/2 BPSK | 0 | 1/4 | 1032 | 16 | 2 | 1 | 4224 | 4224 |
|  | 100 | 120 | 32 | 11 | pi/2 BPSK | 0 | 1/4 | 1032 | 16 | 2 | 1 | 4224 | 4224 |
|  | 100 | 120 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 200 | 120 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 200 | 120 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 400 | 120 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 400 | 120 | 256 | 11 | pi/2 BPSK | 0 | 1/4 | 7944 | 24 | 2 | 3 | 33792 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### A.2.3.2 DFT-s-OFDM QPSK

Table A.2.3.2-1: Reference Channels for DFT-s-OFDM QPSK for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 50-200 | 60 | 16 | 11 | QPSK | 2 | 1/6 | 808 | 16 | 2 | 1 | 4048 | 2024 |
|  | 50 | 60 | 32 | 11 | QPSK | 2 | 1/6 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|  | 50 | 60 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 100 | 60 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 100 | 60 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 200 | 60 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 200 | 60 | 256 | 11 | QPSK | 2 | 1/6 | 12808 | 24 | 2 | 4 | 67584 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.2-2: Reference Channels for DFT-s-OFDM QPSK for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 50 | 120 | 16 | 11 | QPSK | 2 | 1/6 | 808 | 16 | 2 | 1 | 4224 | 2112 |
|  | 50 | 120 | 32 | 11 | QPSK | 2 | 1/6 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|  | 100 | 120 | 20 | 11 | QPSK | 2 | 1/6 | 984 | 16 | 2 | 1 | 5060 | 2530 |
|  | 100 | 120 | 32 | 11 | QPSK | 2 | 1/6 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|  | 100 | 120 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 200 | 120 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 200 | 120 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 400 | 120 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 400 | 120 | 256 | 11 | QPSK | 2 | 1/6 | 12808 | 24 | 2 | 4 | 67584 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### A.2.3.3 DFT-s-OFDM 16QAM

Table A.2.3.3-1: Reference Channels for DFT-s-OFDM 16QAM for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 50 | 60 | 32 | 11 | 16QAM | 10 | 1/3 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|  | 50 | 60 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 100 | 60 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 100 | 60 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 200 | 60 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 200 | 60 | 256 | 11 | 16QAM | 10 | 1/3 | 45096 | 24 | 1 | 6 | 135168 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.3-2: Reference Channels for DFT-s-OFDM 16QAM for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 50 | 120 | 16 | 11 | 16QAM | 10 | 1/3 | 2792 | 16 | 2 | 1 | 8448 | 2112 |
|  | 50 | 120 | 32 | 11 | 16QAM | 10 | 1/3 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|  | 100 | 120 | 32 | 11 | 16QAM | 10 | 1/3 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|  | 100 | 120 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 200 | 120 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 200 | 120 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 400 | 120 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 400 | 120 | 256 | 11 | 16QAM | 10 | 1/3 | 45096 | 24 | 1 | 6 | 135168 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### A.2.3.4 DFT-s-OFDM 64QAM

Table A.2.3.4-1: Reference Channels for DFT-s-OFDM 64QAM for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | 64QAM | 18 | 1/2 | 408 | 16 | 2 | 1 | 792 | 132 |
|  | 50 | 60 | 32 | 11 | 64QAM | 18 | 1/2 | 12808 | 24 | 1 | 2 | 25344 | 4224 |
|  | 50 | 60 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 100 | 60 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 100 | 60 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 200 | 60 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 200 | 60 | 256 | 11 | 64QAM | 18 | 1/2 | 102416 | 24 | 1 | 13 | 202752 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.4-2: Reference Channels for DFT-s-OFDM 64QAM for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | 64QAM | 18 | 1/2 | 408 | 16 | 2 | 1 | 792 | 132 |
|  | 50 | 120 | 16 | 11 | 64QAM | 18 | 1/2 | 6400 | 24 | 1 | 1 | 12672 | 2112 |
|  | 50 | 120 | 32 | 11 | 64QAM | 18 | 1/2 | 12808 | 24 | 1 | 2 | 25344 | 4224 |
|  | 100 | 120 | 32 | 11 | 64QAM | 18 | 1/2 | 12808 | 24 | 1 | 2 | 25344 | 4224 |
|  | 100 | 120 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 200 | 120 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 200 | 120 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 400 | 120 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 400 | 120 | 256 | 11 | 64QAM | 18 | 1/2 | 102416 | 24 | 1 | 13 | 202752 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### A.2.3.5 CP-OFDM QPSK

Table A.2.3.5-1: Reference Channels for CP-OFDM QPSK for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 50-200 | 60 | 16 | 11 | QPSK | 2 | 1/6 | 808 | 16 | 2 | 1 | 4048 | 2024 |
|  | 50 | 60 | 33 | 11 | QPSK | 2 | 1/6 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|  | 50 | 60 | 66 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17424 | 8712 |
|  | 100 | 60 | 66 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17424 | 8712 |
|  | 100 | 60 | 132 | 11 | QPSK | 2 | 1/6 | 6536 | 24 | 2 | 2 | 34848 | 17424 |
|  | 200 | 60 | 132 | 11 | QPSK | 2 | 1/6 | 6536 | 24 | 2 | 2 | 34848 | 17424 |
|  | 200 | 60 | 264 | 11 | QPSK | 2 | 1/6 | 13064 | 24 | 2 | 4 | 69696 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.5-2: Reference Channels for CP-OFDM QPSK for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots(Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 50 | 120 | 16 | 11 | QPSK | 2 | 1/6 | 808 | 16 | 2 | 1 | 4224 | 2112 |
|  | 50 | 120 | 32 | 11 | QPSK | 2 | 1/6 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|  | 100 | 120 | 33 | 11 | QPSK | 2 | 1/6 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|  | 100 | 120 | 66 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17424 | 8712 |
|  | 200 | 120 | 66 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17424 | 8712 |
|  | 200 | 120 | 132 | 11 | QPSK | 2 | 1/6 | 6536 | 24 | 2 | 2 | 34848 | 17424 |
|  | 400 | 120 | 132 | 11 | QPSK | 2 | 1/6 | 6536 | 24 | 2 | 2 | 34848 | 17424 |
|  | 400 | 120 | 264 | 11 | QPSK | 2 | 1/6 | 13064 | 24 | 2 | 4 | 69696 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### A.2.3.6 CP-OFDM 16QAM

Table A.2.3.6-1: Reference Channels for CP-OFDM 16QAM for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 50 | 60 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 50 | 60 | 66 | 11 | 16QAM | 10 | 1/3 | 11528 | 24 | 1 | 2 | 34848 | 8712 |
|  | 100 | 60 | 66 | 11 | 16QAM | 10 | 1/3 | 11528 | 24 | 1 | 2 | 34848 | 8712 |
|  | 100 | 60 | 132 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 69696 | 17424 |
|  | 200 | 60 | 132 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 69696 | 17424 |
|  | 200 | 60 | 264 | 11 | 16QAM | 10 | 1/3 | 46104 | 24 | 1 | 6 | 139392 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.  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: Indexes of active UL slots are given Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.6-2: Reference Channels for CP-OFDM 16QAM for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 50 | 120 | 16 | 11 | 16QAM | 10 | 1/3 | 2792 | 16 | 2 | 1 | 8448 | 2112 |
|  | 50 | 120 | 32 | 11 | 16QAM | 10 | 1/3 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|  | 100 | 120 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 100 | 120 | 66 | 11 | 16QAM | 10 | 1/3 | 11528 | 24 | 1 | 2 | 34848 | 8712 |
|  | 200 | 120 | 66 | 11 | 16QAM | 10 | 1/3 | 11528 | 24 | 1 | 2 | 34848 | 8712 |
|  | 200 | 120 | 132 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 69696 | 17424 |
|  | 400 | 120 | 132 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 69696 | 17424 |
|  | 400 | 120 | 264 | 11 | 16QAM | 10 | 1/3 | 46104 | 24 | 1 | 6 | 139392 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### A.2.3.7 CP-OFDM 64QAM

Table A.2.3.7-1: Reference Channels for CP-OFDM 64QAM for 60 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-200 | 60 | 1 | 11 | 64QAM | 19 | 1/2 | 408 | 16 | 2 | 1 | 792 | 132 |
|  | 50 | 60 | 33 | 11 | 64QAM | 19 | 1/2 | 13064 | 24 | 1 | 2 | 26136 | 4356 |
|  | 50 | 60 | 66 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 52272 | 8712 |
|  | 100 | 60 | 66 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 52272 | 8712 |
|  | 100 | 60 | 132 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 104544 | 17424 |
|  | 200 | 60 | 132 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 104544 | 17424 |
|  | 200 | 60 | 264 | 11 | 64QAM | 19 | 1/2 | 106576 | 24 | 1 | 13 | 209088 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

Table A.2.3.7-2: Reference Channels for CP-OFDM 64QAM for 120 kHz SCS

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Channel bandwidth | Subcarrier Spacing | Allocated resource blocks | CP-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Target Coding Rate | Payload size for UL slots (Note 4) | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for UL slots (Note 3, Note 4) | Total number of bits per slot for UL slots (Note 4) | Total modulated symbols per slot for UL slots (Note 4) |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 50-400 | 120 | 1 | 11 | 64QAM | 19 | 1/2 | 408 | 16 | 2 | 1 | 792 | 132 |
|  | 50 | 120 | 16 | 11 | 64QAM | 19 | 1/2 | 6400 | 24 | 1 | 1 | 12672 | 2112 |
|  | 50 | 120 | 32 | 11 | 64QAM | 19 | 1/2 | 12808 | 24 | 1 | 2 | 25344 | 4224 |
|  | 100 | 120 | 33 | 11 | 64QAM | 19 | 1/2 | 13064 | 24 | 1 | 2 | 26136 | 4356 |
|  | 100 | 120 | 66 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 52272 | 8712 |
|  | 200 | 120 | 66 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 52272 | 8712 |
|  | 200 | 120 | 132 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 104544 | 17424 |
|  | 400 | 120 | 132 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 104544 | 17424 |
|  | 400 | 120 | 264 | 11 | 64QAM | 19 | 1/2 | 106576 | 24 | 1 | 13 | 209088 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.  NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.  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: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1. | | | | | | | | | | | | | |

### <End of Change 1>