**3GPP TSG-RAN WG4 Meeting #97-e R4-2016783**

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **0582** | **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 FR1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***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.2.2, 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.2.2.1 DFT-s-OFDM Pi/2-BPSK

Table A.2.2.1-1: Reference Channels for DFT-s-OFDM Pi/2-BPSK for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 5 | 15 | 12 | 11 | pi/2 BPSK | 0 | 1/4 | 384 | 16 | 2 | 1 | 1584 | 1584 |
|  | 5 | 15 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 10 | 15 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 10 | 15 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 15 | 15 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 15 | 15 | 75 | 11 | pi/2 BPSK | 0 | 1/4 | 2408 | 16 | 2 | 1 | 9900 | 9900 |
|  | 20 | 15 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 20 | 15 | 100 | 11 | pi/2 BPSK | 0 | 1/4 | 3104 | 16 | 2 | 1 | 13200 | 13200 |
|  | 25 | 15 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 25 | 15 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 30 | 15 | 80 | 11 | pi/2 BPSK | 0 | 1/4 | 2472 | 16 | 2 | 1 | 10560 | 10560 |
|  | 30 | 15 | 160 | 11 | pi/2 BPSK | 0 | 1/4 | 4872 | 24 | 2 | 2 | 21120 | 21120 |
|  | 40 | 15 | 108 | 11 | pi/2 BPSK | 0 | 1/4 | 3368 | 16 | 2 | 1 | 14256 | 14256 |
|  | 40 | 15 | 216 | 11 | pi/2 BPSK | 0 | 1/4 | 6664 | 24 | 2 | 2 | 28512 | 28512 |
|  | 50 | 15 | 135 | 11 | pi/2 BPSK | 0 | 1/4 | 4104 | 24 | 2 | 2 | 17820 | 17820 |
|  | 50 | 15 | 270 | 11 | pi/2 BPSK | 0 | 1/4 | 8448 | 24 | 2 | 3 | 35640 | 35640 |
| 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 TS 38.214 [10].  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.2.2.1-2: Reference Channels for DFT-s-OFDM Pi/2-BPSK for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 5 | 30 | 5 | 11 | pi/2 BPSK | 0 | 1/4 | 160 | 16 | 2 | 1 | 660 | 660 |
|  | 5 | 30 | 10 | 11 | pi/2 BPSK | 0 | 1/4 | 320 | 16 | 2 | 1 | 1320 | 1320 |
|  | 10 | 30 | 12 | 11 | pi/2 BPSK | 0 | 1/4 | 384 | 16 | 2 | 1 | 1584 | 1584 |
|  | 10 | 30 | 24 | 11 | pi/2 BPSK | 0 | 1/4 | 768 | 16 | 2 | 1 | 3168 | 3168 |
|  | 15 | 30 | 18 | 11 | pi/2 BPSK | 0 | 1/4 | 576 | 16 | 2 | 1 | 2376 | 2376 |
|  | 15 | 30 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 20 | 30 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 20 | 30 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 25 | 30 | 32 | 11 | pi/2 BPSK | 0 | 1/4 | 1032 | 16 | 2 | 1 | 4224 | 4224 |
|  | 25 | 30 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 30 | 30 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 30 | 30 | 75 | 11 | pi/2 BPSK | 0 | 1/4 | 2408 | 16 | 2 | 1 | 9900 | 9900 |
|  | 40 | 30 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 40 | 30 | 100 | 11 | pi/2 BPSK | 0 | 1/4 | 3104 | 16 | 2 | 1 | 13200 | 13200 |
|  | 50 | 30 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 50 | 30 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 60 | 30 | 81 | 11 | pi/2 BPSK | 0 | 1/4 | 2536 | 16 | 2 | 1 | 10692 | 10692 |
|  | 60 | 30 | 162 | 11 | pi/2 BPSK | 0 | 1/4 | 5000 | 24 | 2 | 2 | 21384 | 21384 |
|  | 80 | 30 | 108 | 11 | pi/2 BPSK | 0 | 1/4 | 3368 | 16 | 2 | 1 | 14256 | 14256 |
|  | 80 | 30 | 216 | 11 | pi/2 BPSK | 0 | 1/4 | 6664 | 24 | 2 | 2 | 28512 | 28512 |
|  | 90 | 30 | 120 | 11 | pi/2 BPSK | 0 | 1/4 | 3752 | 16 | 2 | 1 | 15840 | 15840 |
|  | 90 | 30 | 243 | 11 | pi/2 BPSK | 0 | 1/4 | 7560 | 24 | 2 | 2 | 32076 | 32076 |
|  | 100 | 30 | 135 | 11 | pi/2 BPSK | 0 | 1/4 | 4104 | 24 | 2 | 2 | 17820 | 17820 |
|  | 100 | 30 | 270 | 11 | pi/2 BPSK | 0 | 1/4 | 8448 | 24 | 2 | 3 | 35640 | 35640 |
| 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 TS 38.214 [10].  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.2.2.1-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 10 | 60 | 5 | 11 | pi/2 BPSK | 0 | 1/4 | 160 | 16 | 2 | 1 | 660 | 660 |
|  | 10 | 60 | 10 | 11 | pi/2 BPSK | 0 | 1/4 | 320 | 16 | 2 | 1 | 1320 | 1320 |
|  | 15 | 60 | 9 | 11 | pi/2 BPSK | 0 | 1/4 | 288 | 16 | 2 | 1 | 1188 | 1188 |
|  | 15 | 60 | 18 | 11 | pi/2 BPSK | 0 | 1/4 | 576 | 16 | 2 | 1 | 2376 | 2376 |
|  | 20 | 60 | 12 | 11 | pi/2 BPSK | 0 | 1/4 | 384 | 16 | 2 | 1 | 1584 | 1584 |
|  | 20 | 60 | 24 | 11 | pi/2 BPSK | 0 | 1/4 | 768 | 16 | 2 | 1 | 3168 | 3168 |
|  | 25 | 60 | 15 | 11 | pi/2 BPSK | 0 | 1/4 | 480 | 16 | 2 | 1 | 1980 | 1980 |
|  | 25 | 60 | 30 | 11 | pi/2 BPSK | 0 | 1/4 | 984 | 16 | 2 | 1 | 3960 | 3960 |
|  | 30 | 60 | 18 | 11 | pi/2 BPSK | 0 | 1/4 | 576 | 16 | 2 | 1 | 2376 | 2376 |
|  | 30 | 60 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 40 | 60 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 40 | 60 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 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 |
|  | 60 | 60 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 60 | 60 | 75 | 11 | pi/2 BPSK | 0 | 1/4 | 2408 | 16 | 2 | 1 | 9900 | 9900 |
|  | 80 | 60 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 80 | 60 | 100 | 11 | pi/2 BPSK | 0 | 1/4 | 3104 | 16 | 2 | 1 | 13200 | 13200 |
|  | 90 | 60 | 60 | 11 | pi/2 BPSK | 0 | 1/4 | 1864 | 16 | 2 | 1 | 7920 | 7920 |
|  | 90 | 60 | 120 | 11 | pi/2 BPSK | 0 | 1/4 | 3752 | 16 | 2 | 1 | 15840 | 15840 |
|  | 100 | 60 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 100 | 60 | 135 | 11 | pi/2 BPSK | 0 | 1/4 | 4104 | 24 | 2 | 2 | 17820 | 17820 |
| 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 TS 38.214 [10].  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.2.2.2 DFT-s-OFDM QPSK

Table A.2.2.2-1: Reference Channels for DFT-s-OFDM QPSK for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 15 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 5 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 5 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 10 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 10 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 10 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 15 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 15 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 15 | 15 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 15 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 15 | 15 | 75 | 11 | QPSK | 2 | 1/6 | 3752 | 16 | 2 | 1 | 19800 | 9900 |
|  | 20 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 20 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 20 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 20 | 15 | 100 | 11 | QPSK | 2 | 1/6 | 5000 | 24 | 2 | 2 | 26400 | 13200 |
|  | 25 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 25 | 15 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 25 | 15 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 30 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 30 | 15 | 80 | 11 | QPSK | 2 | 1/6 | 3976 | 24 | 2 | 2 | 21120 | 10560 |
|  | 30 | 15 | 160 | 11 | QPSK | 2 | 1/6 | 7944 | 24 | 2 | 3 | 42240 | 21120 |
|  | 40 | 15 | 108 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28512 | 14256 |
|  | 40 | 15 | 216 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57024 | 28512 |
|  | 50 | 15 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
|  | 50 | 15 | 270 | 11 | QPSK | 2 | 1/6 | 13320 | 24 | 2 | 4 | 71280 | 35640 |
| 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 TS 38.214 [10].  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.2.2.2-2: Reference Channels for DFT-s-OFDM QPSK for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 30 | 5 | 11 | QPSK | 2 | 1/6 | 256 | 16 | 2 | 1 | 1320 | 660 |
|  | 5 | 30 | 10 | 11 | QPSK | 2 | 1/6 | 504 | 16 | 2 | 1 | 2640 | 1320 |
|  | 10 | 30 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 10 | 30 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 15 | 30 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 15 | 30 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 20 | 30 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 20 | 30 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 25 | 30 | 32 | 11 | QPSK | 2 | 1/6 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|  | 25 | 30 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 30 | 30 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 30 | 30 | 75 | 11 | QPSK | 2 | 1/6 | 3752 | 16 | 2 | 1 | 19800 | 9900 |
|  | 40 | 30 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 40 | 30 | 100 | 11 | QPSK | 2 | 1/6 | 5000 | 24 | 2 | 2 | 26400 | 13200 |
|  | 50 | 30 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 50 | 30 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 60 | 30 | 81 | 11 | QPSK | 2 | 1/6 | 4040 | 24 | 2 | 2 | 21384 | 10692 |
|  | 60 | 30 | 162 | 11 | QPSK | 2 | 1/6 | 8064 | 24 | 2 | 3 | 42768 | 21384 |
|  | 80 | 30 | 108 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28512 | 14256 |
|  | 80 | 30 | 216 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57024 | 28512 |
|  | 90 | 30 | 120 | 11 | QPSK | 2 | 1/6 | 5896 | 24 | 2 | 2 | 31680 | 15840 |
|  | 90 | 30 | 243 | 11 | QPSK | 2 | 1/6 | 12040 | 24 | 2 | 4 | 64152 | 32076 |
|  | 100 | 30 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
|  | 100 | 30 | 270 | 11 | QPSK | 2 | 1/6 | 13320 | 24 | 2 | 4 | 71280 | 35640 |
| 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 TS 38.214 [10].  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.2.2.2-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 10 | 60 | 5 | 11 | QPSK | 2 | 1/6 | 256 | 16 | 2 | 1 | 1320 | 660 |
|  | 10 | 60 | 10 | 11 | QPSK | 2 | 1/6 | 504 | 16 | 2 | 1 | 2640 | 1320 |
|  | 15 | 60 | 9 | 11 | QPSK | 2 | 1/6 | 456 | 16 | 2 | 1 | 2376 | 1188 |
|  | 15 | 60 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 20 | 60 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 20 | 60 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 25 | 60 | 15 | 11 | QPSK | 2 | 1/6 | 768 | 16 | 2 | 1 | 3960 | 1980 |
|  | 25 | 60 | 30 | 11 | QPSK | 2 | 1/6 | 1544 | 16 | 2 | 1 | 7920 | 3960 |
|  | 30 | 60 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 30 | 60 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 40 | 60 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 40 | 60 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 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 |
|  | 60 | 60 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 60 | 60 | 75 | 11 | QPSK | 2 | 1/6 | 3752 | 16 | 2 | 1 | 19800 | 9900 |
|  | 80 | 60 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 80 | 60 | 100 | 11 | QPSK | 2 | 1/6 | 5000 | 24 | 2 | 2 | 26400 | 13200 |
|  | 90 | 60 | 60 | 11 | QPSK | 2 | 1/6 | 3104 | 16 | 2 | 1 | 15840 | 7920 |
|  | 90 | 60 | 120 | 11 | QPSK | 2 | 1/6 | 5896 | 24 | 2 | 2 | 31680 | 15840 |
|  | 100 | 60 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 100 | 60 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
| 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 TS 38.214 [10].  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.2.2.3 DFT-s-OFDM 16QAM

Table A.2.2.3-1: Reference Channels for DFT-s-OFDM 16QAM for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 15 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 5 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 15 | 15 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 15 | 15 | 75 | 11 | 16QAM | 10 | 1/3 | 13064 | 24 | 1 | 2 | 39600 | 9900 |
|  | 20 | 15 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 20 | 15 | 100 | 11 | 16QAM | 10 | 1/3 | 17424 | 24 | 1 | 3 | 52800 | 13200 |
|  | 25 | 15 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 25 | 15 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 30 | 15 | 80 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42240 | 10560 |
|  | 30 | 15 | 160 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 84480 | 21120 |
|  | 40 | 15 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 40 | 15 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 50 | 15 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 50 | 15 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| 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 TS 38.214 [10].  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.2.2.3-2: Reference Channels for DFT-s-OFDM 16QAM for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 30 | 5 | 11 | 16QAM | 10 | 1/3 | 888 | 16 | 2 | 1 | 2640 | 660 |
|  | 5 | 30 | 10 | 11 | 16QAM | 10 | 1/3 | 1800 | 16 | 2 | 1 | 5280 | 1320 |
|  | 10 | 30 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 10 | 30 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 15 | 30 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 15 | 30 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 20 | 30 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 20 | 30 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 25 | 30 | 32 | 11 | 16QAM | 10 | 1/3 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|  | 25 | 30 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 30 | 30 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 30 | 30 | 75 | 11 | 16QAM | 10 | 1/3 | 13064 | 24 | 1 | 2 | 39600 | 9900 |
|  | 40 | 30 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 40 | 30 | 100 | 11 | 16QAM | 10 | 1/3 | 17424 | 24 | 1 | 3 | 52800 | 13200 |
|  | 50 | 30 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 50 | 30 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 60 | 30 | 81 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42768 | 10692 |
|  | 60 | 30 | 162 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 85536 | 21384 |
|  | 80 | 30 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 80 | 30 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 90 | 30 | 120 | 11 | 16QAM | 10 | 1/3 | 21000 | 24 | 1 | 3 | 63360 | 15840 |
|  | 90 | 30 | 243 | 11 | 16QAM | 10 | 1/3 | 43032 | 24 | 1 | 6 | 128304 | 32076 |
|  | 100 | 30 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 100 | 30 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| 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 TS 38.214 [10].  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.2.2.3-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 10 | 60 | 5 | 11 | 16QAM | 10 | 1/3 | 888 | 16 | 2 | 1 | 2640 | 660 |
|  | 10 | 60 | 10 | 11 | 16QAM | 10 | 1/3 | 1800 | 16 | 2 | 1 | 5280 | 1320 |
|  | 15 | 60 | 9 | 11 | 16QAM | 10 | 1/3 | 1608 | 16 | 2 | 1 | 4752 | 1188 |
|  | 15 | 60 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 20 | 60 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 20 | 60 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 25 | 60 | 15 | 11 | 16QAM | 10 | 1/3 | 2664 | 16 | 2 | 1 | 7920 | 1980 |
|  | 25 | 60 | 30 | 11 | 16QAM | 10 | 1/3 | 5248 | 24 | 1 | 1 | 15840 | 3960 |
|  | 30 | 60 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 30 | 60 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 40 | 60 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 40 | 60 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 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 |
|  | 60 | 60 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 60 | 60 | 75 | 11 | 16QAM | 10 | 1/3 | 13064 | 24 | 1 | 2 | 39600 | 9900 |
|  | 80 | 60 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 80 | 60 | 100 | 11 | 16QAM | 10 | 1/3 | 17424 | 24 | 1 | 3 | 52800 | 13200 |
|  | 90 | 60 | 60 | 11 | 16QAM | 10 | 1/3 | 10504 | 24 | 1 | 2 | 31680 | 7920 |
|  | 90 | 60 | 120 | 11 | 16QAM | 10 | 1/3 | 21000 | 24 | 1 | 3 | 63360 | 15840 |
|  | 100 | 60 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 100 | 60 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
| 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 TS 38.214 [10].  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.2.2.4 DFT-s-OFDM 64QAM

Table A.2.2.4-1: Reference Channels for DFT-s-OFDM 64QAM for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 64QAM | 18 | 1/2 | 9992 | 24 | 1 | 2 | 19800 | 3300 |
|  | 10 | 15 | 50 | 11 | 64QAM | 18 | 1/2 | 19968 | 24 | 1 | 3 | 39600 | 6600 |
|  | 15 | 15 | 75 | 11 | 64QAM | 18 | 1/2 | 30216 | 24 | 1 | 4 | 59400 | 9900 |
|  | 20 | 15 | 100 | 11 | 64QAM | 18 | 1/2 | 39936 | 24 | 1 | 5 | 79200 | 13200 |
|  | 25 | 15 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 30 | 15 | 160 | 11 | 64QAM | 18 | 1/2 | 63528 | 24 | 1 | 8 | 126720 | 21120 |
|  | 40 | 15 | 216 | 11 | 64QAM | 18 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 50 | 15 | 270 | 11 | 64QAM | 18 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| 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 TS 38.214 [10].  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.2.2.4-2: Reference Channels for DFT-s-OFDM 64QAM for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 10 | 11 | 64QAM | 18 | 1/2 | 3968 | 24 | 1 | 1 | 7920 | 1320 |
|  | 10 | 30 | 24 | 11 | 64QAM | 18 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 15 | 30 | 36 | 11 | 64QAM | 18 | 1/2 | 14344 | 24 | 1 | 2 | 28512 | 4752 |
|  | 20 | 30 | 50 | 11 | 64QAM | 18 | 1/2 | 19968 | 24 | 1 | 3 | 39600 | 6600 |
|  | 25 | 30 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 30 | 30 | 75 | 11 | 64QAM | 18 | 1/2 | 30216 | 24 | 1 | 4 | 59400 | 9900 |
|  | 40 | 30 | 100 | 11 | 64QAM | 18 | 1/2 | 39936 | 24 | 1 | 5 | 79200 | 13200 |
|  | 50 | 30 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 60 | 30 | 162 | 11 | 64QAM | 18 | 1/2 | 64552 | 24 | 1 | 8 | 128304 | 21384 |
|  | 80 | 30 | 216 | 11 | 64QAM | 18 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 90 | 30 | 243 | 11 | 64QAM | 18 | 1/2 | 96264 | 24 | 1 | 12 | 192456 | 32076 |
|  | 100 | 30 | 270 | 11 | 64QAM | 18 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| 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 TS 38.214 [10].  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.2.2.4-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 10 | 11 | 64QAM | 18 | 1/2 | 3968 | 24 | 1 | 1 | 7920 | 1320 |
|  | 15 | 60 | 18 | 11 | 64QAM | 18 | 1/2 | 7168 | 24 | 1 | 1 | 14256 | 2376 |
|  | 20 | 60 | 24 | 11 | 64QAM | 18 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 25 | 60 | 30 | 11 | 64QAM | 18 | 1/2 | 12040 | 24 | 1 | 2 | 23760 | 3960 |
|  | 30 | 60 | 36 | 11 | 64QAM | 18 | 1/2 | 14344 | 24 | 1 | 2 | 28512 | 4752 |
|  | 40 | 60 | 50 | 11 | 64QAM | 18 | 1/2 | 19968 | 24 | 1 | 3 | 39600 | 6600 |
|  | 50 | 60 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 60 | 60 | 75 | 11 | 64QAM | 18 | 1/2 | 30216 | 24 | 1 | 4 | 59400 | 9900 |
|  | 80 | 60 | 100 | 11 | 64QAM | 18 | 1/2 | 39936 | 24 | 1 | 5 | 79200 | 13200 |
|  | 90 | 60 | 120 | 11 | 64QAM | 18 | 1/2 | 48168 | 24 | 1 | 6 | 95040 | 15840 |
|  | 100 | 60 | 135 | 11 | 64QAM | 18 | 1/2 | 54296 | 24 | 1 | 7 | 106920 | 17820 |
| 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 TS 38.214 [10].  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.2.2.5 DFT-s-OFDM 256QAM

Table A.2.2.5-1: Reference Channels for DFT-s-OFDM 256QAM for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 256QAM | 20 | 2/3 | 17424 | 24 | 1 | 3 | 26400 | 3300 |
|  | 10 | 15 | 50 | 11 | 256QAM | 20 | 2/3 | 34816 | 24 | 1 | 5 | 52800 | 6600 |
|  | 15 | 15 | 75 | 11 | 256QAM | 20 | 2/3 | 53288 | 24 | 1 | 7 | 79200 | 9900 |
|  | 20 | 15 | 100 | 11 | 256QAM | 20 | 2/3 | 69672 | 24 | 1 | 9 | 105600 | 13200 |
|  | 25 | 15 | 128 | 11 | 256QAM | 20 | 2/3 | 90176 | 24 | 1 | 11 | 135168 | 16896 |
|  | 30 | 15 | 160 | 11 | 256QAM | 20 | 2/3 | 112648 | 24 | 1 | 14 | 168960 | 21120 |
|  | 40 | 15 | 216 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 228096 | 28512 |
|  | 50 | 15 | 270 | 11 | 256QAM | 20 | 2/3 | 188576 | 24 | 1 | 23 | 285120 | 35640 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.2.5-2: Reference Channels for DFT-s-OFDM 256QAM for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 10 | 11 | 256QAM | 20 | 2/3 | 7040 | 24 | 1 | 1 | 10560 | 1320 |
|  | 10 | 30 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 15 | 30 | 36 | 11 | 256QAM | 20 | 2/3 | 25104 | 24 | 1 | 3 | 38016 | 4752 |
|  | 20 | 30 | 50 | 11 | 256QAM | 20 | 2/3 | 34816 | 24 | 1 | 5 | 52800 | 6600 |
|  | 25 | 30 | 64 | 11 | 256QAM | 20 | 2/3 | 45096 | 24 | 1 | 6 | 67584 | 8448 |
|  | 30 | 30 | 75 | 11 | 256QAM | 20 | 2/3 | 53288 | 24 | 1 | 7 | 79200 | 9900 |
|  | 40 | 30 | 100 | 11 | 256QAM | 20 | 2/3 | 69672 | 24 | 1 | 9 | 105600 | 13200 |
|  | 50 | 30 | 128 | 11 | 256QAM | 20 | 2/3 | 90176 | 24 | 1 | 11 | 135168 | 16896 |
|  | 60 | 30 | 162 | 11 | 256QAM | 20 | 2/3 | 114776 | 24 | 1 | 14 | 171072 | 21384 |
|  | 80 | 30 | 216 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 228096 | 28512 |
|  | 90 | 30 | 243 | 11 | 256QAM | 20 | 2/3 | 172176 | 24 | 1 | 21 | 256608 | 32076 |
|  | 100 | 30 | 270 | 11 | 256QAM | 20 | 2/3 | 188576 | 24 | 1 | 23 | 285120 | 35640 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.2.5-3: Reference Channels for DFT-s-OFDM 256QAM 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 10 | 11 | 256QAM | 20 | 2/3 | 7040 | 24 | 1 | 1 | 10560 | 1320 |
|  | 15 | 60 | 18 | 11 | 256QAM | 20 | 2/3 | 12552 | 24 | 1 | 2 | 19008 | 2376 |
|  | 20 | 60 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 25 | 60 | 30 | 11 | 256QAM | 20 | 2/3 | 21000 | 24 | 1 | 3 | 31680 | 3960 |
|  | 30 | 60 | 36 | 11 | 256QAM | 20 | 2/3 | 25104 | 24 | 1 | 3 | 38016 | 4752 |
|  | 40 | 60 | 50 | 11 | 256QAM | 20 | 2/3 | 34816 | 24 | 1 | 5 | 52800 | 6600 |
|  | 50 | 60 | 64 | 11 | 256QAM | 20 | 2/3 | 45096 | 24 | 1 | 6 | 67584 | 8448 |
|  | 60 | 60 | 75 | 11 | 256QAM | 20 | 2/3 | 53288 | 24 | 1 | 7 | 79200 | 9900 |
|  | 80 | 60 | 100 | 11 | 256QAM | 20 | 2/3 | 69672 | 24 | 1 | 9 | 105600 | 13200 |
|  | 90 | 60 | 120 | 11 | 256QAM | 20 | 2/3 | 83976 | 24 | 1 | 10 | 126720 | 15840 |
|  | 100 | 60 | 135 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 142560 | 17820 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.2.6 CP-OFDM QPSK

Table A.2.2.6-1: Reference Channels for CP-OFDM QPSK for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 15 | 13 | 11 | QPSK | 2 | 1/6 | 672 | 16 | 2 | 1 | 3432 | 1716 |
|  | 5 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 10 | 15 | 26 | 11 | QPSK | 2 | 1/6 | 1288 | 16 | 2 | 1 | 6864 | 3432 |
|  | 10 | 15 | 52 | 11 | QPSK | 2 | 1/6 | 2600 | 16 | 2 | 1 | 13728 | 6864 |
|  | 15 | 15 | 40 | 11 | QPSK | 2 | 1/6 | 2024 | 16 | 2 | 1 | 10560 | 5280 |
|  | 15 | 15 | 79 | 11 | QPSK | 2 | 1/6 | 3912 | 24 | 2 | 2 | 20856 | 10428 |
|  | 20 | 15 | 53 | 11 | QPSK | 2 | 1/6 | 2664 | 16 | 2 | 1 | 13992 | 6996 |
|  | 20 | 15 | 106 | 11 | QPSK | 2 | 1/6 | 5256 | 24 | 2 | 2 | 27984 | 13992 |
|  | 25 | 15 | 67 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17688 | 8844 |
|  | 25 | 15 | 133 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35112 | 17556 |
|  | 30 | 15 | 80 | 11 | QPSK | 2 | 1/6 | 3976 | 24 | 2 | 2 | 21120 | 10560 |
|  | 30 | 15 | 160 | 11 | QPSK | 2 | 1/6 | 7944 | 24 | 2 | 3 | 42240 | 21120 |
|  | 40 | 15 | 108 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28512 | 14256 |
|  | 40 | 15 | 216 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57024 | 28512 |
|  | 50 | 15 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
|  | 50 | 15 | 270 | 11 | QPSK | 2 | 1/6 | 13320 | 24 | 2 | 4 | 71280 | 35640 |
| 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 TS 38.214 [10].  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.2.2.6-2: Reference Channels for CP-OFDM QPSK for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 30 | 6 | 11 | QPSK | 2 | 1/6 | 304 | 16 | 2 | 1 | 1584 | 792 |
|  | 5 | 30 | 11 | 11 | QPSK | 2 | 1/6 | 552 | 16 | 2 | 1 | 2904 | 1452 |
|  | 10 | 30 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 10 | 30 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 15 | 30 | 19 | 11 | QPSK | 2 | 1/6 | 984 | 16 | 2 | 1 | 5016 | 2508 |
|  | 15 | 30 | 38 | 11 | QPSK | 2 | 1/6 | 1928 | 16 | 2 | 1 | 10032 | 5016 |
|  | 20 | 30 | 26 | 11 | QPSK | 2 | 1/6 | 1288 | 16 | 2 | 1 | 6864 | 3432 |
|  | 20 | 30 | 51 | 11 | QPSK | 2 | 1/6 | 2536 | 16 | 2 | 1 | 13464 | 6732 |
|  | 25 | 30 | 33 | 11 | QPSK | 2 | 1/6 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|  | 25 | 30 | 65 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 17160 | 8580 |
|  | 30 | 30 | 39 | 11 | QPSK | 2 | 1/6 | 2024 | 16 | 2 | 1 | 10296 | 5148 |
|  | 30 | 30 | 78 | 11 | QPSK | 2 | 1/6 | 3848 | 24 | 2 | 2 | 20592 | 10296 |
|  | 40 | 30 | 53 | 11 | QPSK | 2 | 1/6 | 2664 | 16 | 2 | 1 | 13992 | 6996 |
|  | 40 | 30 | 106 | 11 | QPSK | 2 | 1/6 | 5256 | 24 | 2 | 2 | 27984 | 13992 |
|  | 50 | 30 | 67 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17688 | 8844 |
|  | 50 | 30 | 133 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35112 | 17556 |
|  | 60 | 30 | 81 | 11 | QPSK | 2 | 1/6 | 4040 | 24 | 2 | 2 | 21384 | 10692 |
|  | 60 | 30 | 162 | 11 | QPSK | 2 | 1/6 | 8064 | 24 | 2 | 3 | 42768 | 21384 |
|  | 80 | 30 | 109 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28776 | 14388 |
|  | 80 | 30 | 217 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57288 | 28644 |
|  | 90 | 30 | 123 | 11 | QPSK | 2 | 1/6 | 6152 | 24 | 2 | 2 | 32472 | 16236 |
|  | 90 | 30 | 245 | 11 | QPSK | 2 | 1/6 | 12296 | 24 | 2 | 4 | 64680 | 32340 |
|  | 100 | 30 | 137 | 11 | QPSK | 2 | 1/6 | 6792 | 24 | 2 | 2 | 36168 | 18084 |
|  | 100 | 30 | 273 | 11 | QPSK | 2 | 1/6 | 13576 | 24 | 2 | 4 | 72072 | 36036 |
| 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 TS 38.214 [10].  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.2.2.6-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 10 | 60 | 6 | 11 | QPSK | 2 | 1/6 | 304 | 16 | 2 | 1 | 1584 | 792 |
|  | 10 | 60 | 11 | 11 | QPSK | 2 | 1/6 | 552 | 16 | 2 | 1 | 2904 | 1452 |
|  | 15 | 60 | 9 | 11 | QPSK | 2 | 1/6 | 456 | 16 | 2 | 1 | 2376 | 1188 |
|  | 15 | 60 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 20 | 60 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 20 | 60 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 25 | 60 | 16 | 11 | QPSK | 2 | 1/6 | 808 | 16 | 2 | 1 | 4224 | 2112 |
|  | 25 | 60 | 31 | 11 | QPSK | 2 | 1/6 | 1544 | 16 | 2 | 1 | 8184 | 4092 |
|  | 30 | 60 | 19 | 11 | QPSK | 2 | 1/6 | 984 | 16 | 2 | 1 | 5016 | 2508 |
|  | 30 | 60 | 38 | 11 | QPSK | 2 | 1/6 | 1928 | 16 | 2 | 1 | 10032 | 5016 |
|  | 40 | 60 | 26 | 11 | QPSK | 2 | 1/6 | 1288 | 16 | 2 | 1 | 6864 | 3432 |
|  | 40 | 60 | 51 | 11 | QPSK | 2 | 1/6 | 2536 | 16 | 2 | 1 | 13464 | 6732 |
|  | 50 | 60 | 33 | 11 | QPSK | 2 | 1/6 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|  | 50 | 60 | 65 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 17160 | 8580 |
|  | 60 | 60 | 40 | 11 | QPSK | 2 | 1/6 | 2024 | 16 | 2 | 1 | 10560 | 5280 |
|  | 60 | 60 | 79 | 11 | QPSK | 2 | 1/6 | 3912 | 24 | 2 | 2 | 20856 | 10428 |
|  | 80 | 60 | 54 | 11 | QPSK | 2 | 1/6 | 2664 | 16 | 2 | 1 | 14256 | 7128 |
|  | 80 | 60 | 107 | 11 | QPSK | 2 | 1/6 | 5256 | 24 | 2 | 2 | 28248 | 14124 |
|  | 90 | 60 | 61 | 11 | QPSK | 2 | 1/6 | 3104 | 16 | 2 | 1 | 16104 | 8052 |
|  | 90 | 60 | 121 | 11 | QPSK | 2 | 1/6 | 6024 | 24 | 2 | 2 | 31944 | 15972 |
|  | 100 | 60 | 68 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17952 | 8976 |
|  | 100 | 60 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
| 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 TS 38.214 [10].  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.2.2.7 CP-OFDM 16QAM

Table A.2.2.7-1: Reference Channels for CP-OFDM 16QAM for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 15 | 13 | 11 | 16QAM | 10 | 1/3 | 2280 | 16 | 2 | 1 | 6864 | 1716 |
|  | 5 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 10 | 15 | 52 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27456 | 6864 |
|  | 15 | 15 | 40 | 11 | 16QAM | 10 | 1/3 | 7040 | 24 | 1 | 1 | 21120 | 5280 |
|  | 15 | 15 | 79 | 11 | 16QAM | 10 | 1/3 | 13832 | 24 | 1 | 2 | 41712 | 10428 |
|  | 20 | 15 | 53 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27984 | 6996 |
|  | 20 | 15 | 106 | 11 | 16QAM | 10 | 1/3 | 18432 | 24 | 1 | 3 | 55968 | 13992 |
|  | 25 | 15 | 67 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35376 | 8844 |
|  | 25 | 15 | 133 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 70224 | 17556 |
|  | 30 | 15 | 80 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42240 | 10560 |
|  | 30 | 15 | 160 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 84480 | 21120 |
|  | 40 | 15 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 40 | 15 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 50 | 15 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 50 | 15 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| 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 TS 38.214 [10].  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.2.2.7-2: Reference Channels for CP-OFDM 16QAM for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 30 | 6 | 11 | 16QAM | 10 | 1/3 | 1064 | 16 | 2 | 1 | 3168 | 792 |
|  | 5 | 30 | 11 | 11 | 16QAM | 10 | 1/3 | 1928 | 16 | 2 | 1 | 5808 | 1452 |
|  | 10 | 30 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 10 | 30 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 15 | 30 | 19 | 11 | 16QAM | 10 | 1/3 | 3368 | 16 | 2 | 1 | 10032 | 2508 |
|  | 15 | 30 | 38 | 11 | 16QAM | 10 | 1/3 | 6656 | 24 | 1 | 1 | 20064 | 5016 |
|  | 20 | 30 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 20 | 30 | 51 | 11 | 16QAM | 10 | 1/3 | 8968 | 24 | 1 | 2 | 26928 | 6732 |
|  | 25 | 30 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 25 | 30 | 65 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 34320 | 8580 |
|  | 30 | 30 | 39 | 11 | 16QAM | 10 | 1/3 | 6784 | 24 | 1 | 1 | 20592 | 5148 |
|  | 30 | 30 | 78 | 11 | 16QAM | 10 | 1/3 | 13576 | 24 | 1 | 2 | 41184 | 10296 |
|  | 40 | 30 | 53 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27984 | 6996 |
|  | 40 | 30 | 106 | 11 | 16QAM | 10 | 1/3 | 18432 | 24 | 1 | 3 | 55968 | 13992 |
|  | 50 | 30 | 67 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35376 | 8844 |
|  | 50 | 30 | 133 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 70224 | 17556 |
|  | 60 | 30 | 81 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42768 | 10692 |
|  | 60 | 30 | 162 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 85536 | 21384 |
|  | 80 | 30 | 109 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57552 | 14388 |
|  | 80 | 30 | 217 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114576 | 28644 |
|  | 90 | 30 | 123 | 11 | 16QAM | 10 | 1/3 | 21504 | 24 | 1 | 3 | 64944 | 16236 |
|  | 90 | 30 | 245 | 11 | 16QAM | 10 | 1/3 | 43032 | 24 | 1 | 6 | 129360 | 32340 |
|  | 100 | 30 | 137 | 11 | 16QAM | 10 | 1/3 | 24072 | 24 | 1 | 3 | 72336 | 18084 |
|  | 100 | 30 | 273 | 11 | 16QAM | 10 | 1/3 | 48168 | 24 | 1 | 6 | 144144 | 36036 |
| 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 TS 38.214 [10].  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.2.2.7-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 10 | 60 | 6 | 11 | 16QAM | 10 | 1/3 | 1064 | 16 | 2 | 1 | 3168 | 792 |
|  | 10 | 60 | 11 | 11 | 16QAM | 10 | 1/3 | 1928 | 16 | 2 | 1 | 5808 | 1452 |
|  | 15 | 60 | 9 | 11 | 16QAM | 10 | 1/3 | 1608 | 16 | 2 | 1 | 4752 | 1188 |
|  | 15 | 60 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 20 | 60 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 20 | 60 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 25 | 60 | 16 | 11 | 16QAM | 10 | 1/3 | 2792 | 16 | 2 | 1 | 8448 | 2112 |
|  | 25 | 60 | 31 | 11 | 16QAM | 10 | 1/3 | 5376 | 24 | 1 | 1 | 16368 | 4092 |
|  | 30 | 60 | 19 | 11 | 16QAM | 10 | 1/3 | 3368 | 16 | 2 | 1 | 10032 | 2508 |
|  | 30 | 60 | 38 | 11 | 16QAM | 10 | 1/3 | 6656 | 24 | 1 | 1 | 20064 | 5016 |
|  | 40 | 60 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 40 | 60 | 51 | 11 | 16QAM | 10 | 1/3 | 8968 | 24 | 1 | 2 | 26928 | 6732 |
|  | 50 | 60 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 50 | 60 | 65 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 34320 | 8580 |
|  | 60 | 60 | 40 | 11 | 16QAM | 10 | 1/3 | 7040 | 24 | 1 | 1 | 21120 | 5280 |
|  | 60 | 60 | 79 | 11 | 16QAM | 10 | 1/3 | 13832 | 24 | 1 | 2 | 41712 | 10428 |
|  | 80 | 60 | 54 | 11 | 16QAM | 10 | 1/3 | 9480 | 24 | 1 | 2 | 28512 | 7128 |
|  | 80 | 60 | 107 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 56496 | 14124 |
|  | 90 | 60 | 61 | 11 | 16QAM | 10 | 1/3 | 10760 | 24 | 1 | 2 | 32208 | 8052 |
|  | 90 | 60 | 121 | 11 | 16QAM | 10 | 1/3 | 21000 | 24 | 1 | 3 | 63888 | 15972 |
|  | 100 | 60 | 68 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35904 | 8976 |
|  | 100 | 60 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
| 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 TS 38.214 [10].  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.2.2.8 CP-OFDM 64QAM

Table A.2.2.8-1: Reference Channels for CP-OFDM 64QAM for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 64QAM | 19 | 1/2 | 9992 | 24 | 1 | 2 | 19800 | 3300 |
|  | 10 | 15 | 52 | 11 | 64QAM | 19 | 1/2 | 21000 | 24 | 1 | 3 | 41184 | 6864 |
|  | 15 | 15 | 79 | 11 | 64QAM | 19 | 1/2 | 31752 | 24 | 1 | 4 | 62568 | 10428 |
|  | 20 | 15 | 106 | 11 | 64QAM | 19 | 1/2 | 42016 | 24 | 1 | 5 | 83952 | 13992 |
|  | 25 | 15 | 133 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 105336 | 17556 |
|  | 30 | 15 | 160 | 11 | 64QAM | 19 | 1/2 | 63528 | 24 | 1 | 8 | 126720 | 21120 |
|  | 40 | 15 | 216 | 11 | 64QAM | 19 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 50 | 15 | 270 | 11 | 64QAM | 19 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| 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 TS 38.214 [10].  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.2.2.8-2: Reference Channels for CP-OFDM 64QAM for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 11 | 11 | 64QAM | 19 | 1/2 | 4352 | 24 | 1 | 1 | 8712 | 1452 |
|  | 10 | 30 | 24 | 11 | 64QAM | 19 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 15 | 30 | 38 | 11 | 64QAM | 19 | 1/2 | 15112 | 24 | 1 | 2 | 30096 | 5016 |
|  | 20 | 30 | 51 | 11 | 64QAM | 19 | 1/2 | 20496 | 24 | 1 | 3 | 40392 | 6732 |
|  | 25 | 30 | 65 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 51480 | 8580 |
|  | 30 | 30 | 78 | 11 | 64QAM | 19 | 1/2 | 31240 | 24 | 1 | 4 | 61776 | 10296 |
|  | 40 | 30 | 106 | 11 | 64QAM | 19 | 1/2 | 42016 | 24 | 1 | 5 | 83952 | 13992 |
|  | 50 | 30 | 133 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 105336 | 17556 |
|  | 60 | 30 | 162 | 11 | 64QAM | 19 | 1/2 | 64552 | 24 | 1 | 8 | 128304 | 21384 |
|  | 80 | 30 | 217 | 11 | 64QAM | 19 | 1/2 | 86040 | 24 | 1 | 11 | 171864 | 28644 |
|  | 90 | 30 | 245 | 11 | 64QAM | 19 | 1/2 | 98376 | 24 | 1 | 12 | 194040 | 32340 |
|  | 100 | 30 | 273 | 11 | 64QAM | 19 | 1/2 | 108552 | 24 | 1 | 13 | 216216 | 36036 |
| 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 TS 38.214 [10].  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.2.2.8-3: 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 11 | 11 | 64QAM | 19 | 1/2 | 4352 | 24 | 1 | 1 | 8712 | 1452 |
|  | 15 | 60 | 18 | 11 | 64QAM | 19 | 1/2 | 7168 | 24 | 1 | 1 | 14256 | 2376 |
|  | 20 | 60 | 24 | 11 | 64QAM | 19 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 25 | 60 | 31 | 11 | 64QAM | 19 | 1/2 | 12296 | 24 | 1 | 2 | 24552 | 4092 |
|  | 30 | 60 | 38 | 11 | 64QAM | 19 | 1/2 | 15112 | 24 | 1 | 2 | 30096 | 5016 |
|  | 40 | 60 | 51 | 11 | 64QAM | 19 | 1/2 | 20496 | 24 | 1 | 3 | 40392 | 6732 |
|  | 50 | 60 | 65 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 51480 | 8580 |
|  | 60 | 60 | 79 | 11 | 64QAM | 19 | 1/2 | 31752 | 24 | 1 | 4 | 62568 | 10428 |
|  | 80 | 60 | 107 | 11 | 64QAM | 19 | 1/2 | 43032 | 24 | 1 | 6 | 84744 | 14124 |
|  | 90 | 60 | 121 | 11 | 64QAM | 19 | 1/2 | 48168 | 24 | 1 | 6 | 95832 | 15972 |
|  | 100 | 60 | 135 | 11 | 64QAM | 19 | 1/2 | 54296 | 24 | 1 | 7 | 106920 | 17820 |
| 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 TS 38.214 [10].  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.2.2.9 CP-OFDM 256QAM

Table A.2.2.9-1: Reference Channels for CP-OFDM 256QAM for 15 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 256QAM | 20 | 2/3 | 17424 | 24 | 1 | 3 | 26400 | 3300 |
|  | 10 | 15 | 52 | 11 | 256QAM | 20 | 2/3 | 36896 | 24 | 1 | 5 | 54912 | 6864 |
|  | 15 | 15 | 79 | 11 | 256QAM | 20 | 2/3 | 55304 | 24 | 1 | 7 | 83424 | 10428 |
|  | 20 | 15 | 106 | 11 | 256QAM | 20 | 2/3 | 73776 | 24 | 1 | 9 | 111936 | 13992 |
|  | 25 | 15 | 133 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 140448 | 17556 |
|  | 30 | 15 | 160 | 11 | 256QAM | 20 | 2/3 | 112648 | 24 | 1 | 14 | 168960 | 21120 |
|  | 40 | 15 | 216 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 228096 | 28512 |
|  | 50 | 15 | 270 | 11 | 256QAM | 20 | 2/3 | 188576 | 24 | 1 | 23 | 285120 | 35640 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.2.9-2: Reference Channels for CP-OFDM 256QAM for 30 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 11 | 11 | 256QAM | 20 | 2/3 | 7680 | 24 | 1 | 1 | 11616 | 1452 |
|  | 10 | 30 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 15 | 30 | 38 | 11 | 256QAM | 20 | 2/3 | 26632 | 24 | 1 | 4 | 40128 | 5016 |
|  | 20 | 30 | 51 | 11 | 256QAM | 20 | 2/3 | 35856 | 24 | 1 | 5 | 53856 | 6732 |
|  | 25 | 30 | 65 | 11 | 256QAM | 20 | 2/3 | 46104 | 24 | 1 | 6 | 68640 | 8580 |
|  | 30 | 30 | 78 | 11 | 256QAM | 20 | 2/3 | 55304 | 24 | 1 | 7 | 82368 | 10296 |
|  | 40 | 30 | 106 | 11 | 256QAM | 20 | 2/3 | 73776 | 24 | 1 | 9 | 111936 | 13992 |
|  | 50 | 30 | 133 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 140448 | 17556 |
|  | 60 | 30 | 162 | 11 | 256QAM | 20 | 2/3 | 114776 | 24 | 1 | 14 | 171072 | 21384 |
|  | 80 | 30 | 217 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 229152 | 28644 |
|  | 90 | 30 | 245 | 11 | 256QAM | 20 | 2/3 | 172176 | 24 | 1 | 21 | 258720 | 32340 |
|  | 100 | 30 | 273 | 11 | 256QAM | 20 | 2/3 | 192624 | 24 | 1 | 23 | 288288 | 36036 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.2.9-3: Reference Channels for CP-OFDM 256QAM 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 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 11 | 11 | 256QAM | 20 | 2/3 | 7680 | 24 | 1 | 1 | 11616 | 1452 |
|  | 15 | 60 | 18 | 11 | 256QAM | 20 | 2/3 | 12552 | 24 | 1 | 2 | 19008 | 2376 |
|  | 20 | 60 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 25 | 60 | 31 | 11 | 256QAM | 20 | 2/3 | 22032 | 24 | 1 | 3 | 32736 | 4092 |
|  | 30 | 60 | 38 | 11 | 256QAM | 20 | 2/3 | 26632 | 24 | 1 | 4 | 40128 | 5016 |
|  | 40 | 60 | 51 | 11 | 256QAM | 20 | 2/3 | 35856 | 24 | 1 | 5 | 53856 | 6732 |
|  | 50 | 60 | 65 | 11 | 256QAM | 20 | 2/3 | 46104 | 24 | 1 | 6 | 68640 | 8580 |
|  | 60 | 60 | 79 | 11 | 256QAM | 20 | 2/3 | 55304 | 24 | 1 | 7 | 83424 | 10428 |
|  | 80 | 60 | 107 | 11 | 256QAM | 20 | 2/3 | 75792 | 24 | 1 | 9 | 112992 | 14124 |
|  | 90 | 60 | 121 | 11 | 256QAM | 20 | 2/3 | 86040 | 24 | 1 | 11 | 127776 | 15972 |
|  | 100 | 60 | 135 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 142560 | 17820 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.3 Reference measurement channels for TDD

TDD slot patterns defined for reference sensitivity tests will be used for UL RMCs defined below.

### 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 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 5 | 15 | 12 | 11 | pi/2 BPSK | 0 | 1/4 | 384 | 16 | 2 | 1 | 1584 | 1584 |
|  | 5 | 15 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 10 | 15 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 10 | 15 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 15 | 15 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 15 | 15 | 75 | 11 | pi/2 BPSK | 0 | 1/4 | 2408 | 16 | 2 | 1 | 9900 | 9900 |
|  | 20 | 15 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 20 | 15 | 100 | 11 | pi/2 BPSK | 0 | 1/4 | 3104 | 16 | 2 | 1 | 13200 | 13200 |
|  | 25 | 15 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 25 | 15 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 30 | 15 | 80 | 11 | pi/2 BPSK | 0 | 1/4 | 2472 | 16 | 2 | 1 | 10560 | 10560 |
|  | 30 | 15 | 160 | 11 | pi/2 BPSK | 0 | 1/4 | 4872 | 24 | 2 | 2 | 21120 | 21120 |
|  | 40 | 15 | 108 | 11 | pi/2 BPSK | 0 | 1/4 | 3368 | 16 | 2 | 1 | 14256 | 14256 |
|  | 40 | 15 | 216 | 11 | pi/2 BPSK | 0 | 1/4 | 6664 | 24 | 2 | 2 | 28512 | 28512 |
|  | 50 | 15 | 135 | 11 | pi/2 BPSK | 0 | 1/4 | 4104 | 24 | 2 | 2 | 17820 | 17820 |
|  | 50 | 15 | 270 | 11 | pi/2 BPSK | 0 | 1/4 | 8448 | 24 | 2 | 3 | 35640 | 35640 |
| 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 TS 38.214 [10].  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.2.3.1-2: Reference Channels for DFT-s-OFDM Pi/2-BPSK for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 5 | 30 | 5 | 11 | pi/2 BPSK | 0 | 1/4 | 160 | 16 | 2 | 1 | 660 | 660 |
|  | 5 | 30 | 10 | 11 | pi/2 BPSK | 0 | 1/4 | 320 | 16 | 2 | 1 | 1320 | 1320 |
|  | 10 | 30 | 12 | 11 | pi/2 BPSK | 0 | 1/4 | 384 | 16 | 2 | 1 | 1584 | 1584 |
|  | 10 | 30 | 24 | 11 | pi/2 BPSK | 0 | 1/4 | 768 | 16 | 2 | 1 | 3168 | 3168 |
|  | 15 | 30 | 18 | 11 | pi/2 BPSK | 0 | 1/4 | 576 | 16 | 2 | 1 | 2376 | 2376 |
|  | 15 | 30 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 20 | 30 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 20 | 30 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 25 | 30 | 32 | 11 | pi/2 BPSK | 0 | 1/4 | 1032 | 16 | 2 | 1 | 4224 | 4224 |
|  | 25 | 30 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 30 | 30 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 30 | 30 | 75 | 11 | pi/2 BPSK | 0 | 1/4 | 2408 | 16 | 2 | 1 | 9900 | 9900 |
|  | 40 | 30 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 40 | 30 | 100 | 11 | pi/2 BPSK | 0 | 1/4 | 3104 | 16 | 2 | 1 | 13200 | 13200 |
|  | 50 | 30 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 50 | 30 | 128 | 11 | pi/2 BPSK | 0 | 1/4 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|  | 60 | 30 | 81 | 11 | pi/2 BPSK | 0 | 1/4 | 2536 | 16 | 2 | 1 | 10692 | 10692 |
|  | 60 | 30 | 162 | 11 | pi/2 BPSK | 0 | 1/4 | 5000 | 24 | 2 | 2 | 21384 | 21384 |
|  | 80 | 30 | 108 | 11 | pi/2 BPSK | 0 | 1/4 | 3368 | 16 | 2 | 1 | 14256 | 14256 |
|  | 80 | 30 | 216 | 11 | pi/2 BPSK | 0 | 1/4 | 6664 | 24 | 2 | 2 | 28512 | 28512 |
|  | 90 | 30 | 120 | 11 | pi/2 BPSK | 0 | 1/4 | 3752 | 16 | 2 | 1 | 15840 | 15840 |
|  | 90 | 30 | 243 | 11 | pi/2 BPSK | 0 | 1/4 | 7560 | 24 | 2 | 2 | 32076 | 32076 |
|  | 100 | 30 | 135 | 11 | pi/2 BPSK | 0 | 1/4 | 4104 | 24 | 2 | 2 | 17820 | 17820 |
|  | 100 | 30 | 270 | 11 | pi/2 BPSK | 0 | 1/4 | 8448 | 24 | 2 | 3 | 35640 | 35640 |
| 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 TS 38.214 [10].  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.2.3.1-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | pi/2 BPSK | 0 | 1/4 | 32 | 16 | 2 | 1 | 132 | 132 |
|  | 10 | 60 | 5 | 11 | pi/2 BPSK | 0 | 1/4 | 160 | 16 | 2 | 1 | 660 | 660 |
|  | 10 | 60 | 10 | 11 | pi/2 BPSK | 0 | 1/4 | 320 | 16 | 2 | 1 | 1320 | 1320 |
|  | 15 | 60 | 9 | 11 | pi/2 BPSK | 0 | 1/4 | 288 | 16 | 2 | 1 | 1188 | 1188 |
|  | 15 | 60 | 18 | 11 | pi/2 BPSK | 0 | 1/4 | 576 | 16 | 2 | 1 | 2376 | 2376 |
|  | 20 | 60 | 12 | 11 | pi/2 BPSK | 0 | 1/4 | 384 | 16 | 2 | 1 | 1584 | 1584 |
|  | 20 | 60 | 24 | 11 | pi/2 BPSK | 0 | 1/4 | 768 | 16 | 2 | 1 | 3168 | 3168 |
|  | 25 | 60 | 15 | 11 | pi/2 BPSK | 0 | 1/4 | 480 | 16 | 2 | 1 | 1980 | 1980 |
|  | 25 | 60 | 30 | 11 | pi/2 BPSK | 0 | 1/4 | 984 | 16 | 2 | 1 | 3960 | 3960 |
|  | 30 | 60 | 18 | 11 | pi/2 BPSK | 0 | 1/4 | 576 | 16 | 2 | 1 | 2376 | 2376 |
|  | 30 | 60 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 40 | 60 | 25 | 11 | pi/2 BPSK | 0 | 1/4 | 808 | 16 | 2 | 1 | 3300 | 3300 |
|  | 40 | 60 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 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 |
|  | 60 | 60 | 36 | 11 | pi/2 BPSK | 0 | 1/4 | 1128 | 16 | 2 | 1 | 4752 | 4752 |
|  | 60 | 60 | 75 | 11 | pi/2 BPSK | 0 | 1/4 | 2408 | 16 | 2 | 1 | 9900 | 9900 |
|  | 80 | 60 | 50 | 11 | pi/2 BPSK | 0 | 1/4 | 1544 | 16 | 2 | 1 | 6600 | 6600 |
|  | 80 | 60 | 100 | 11 | pi/2 BPSK | 0 | 1/4 | 3104 | 16 | 2 | 1 | 13200 | 13200 |
|  | 90 | 60 | 60 | 11 | pi/2 BPSK | 0 | 1/4 | 1864 | 16 | 2 | 1 | 7920 | 7920 |
|  | 90 | 60 | 120 | 11 | pi/2 BPSK | 0 | 1/4 | 3752 | 16 | 2 | 1 | 15840 | 15840 |
|  | 100 | 60 | 64 | 11 | pi/2 BPSK | 0 | 1/4 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|  | 100 | 60 | 135 | 11 | pi/2 BPSK | 0 | 1/4 | 4104 | 24 | 2 | 2 | 17820 | 17820 |
| 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 TS 38.214 [10].  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.2.3.2 DFT-s-OFDM QPSK

Table A.2.3.2-1: Reference channels for DFT-s-OFDM QPSK for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 15 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 5 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 5 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 10 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 10 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 10 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 15 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 15 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 15 | 15 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 15 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 15 | 15 | 75 | 11 | QPSK | 2 | 1/6 | 3752 | 16 | 2 | 1 | 19800 | 9900 |
|  | 20 | 15 | 20 | 11 | QPSK | 2 | 1/6 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|  | 20 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 20 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 20 | 15 | 100 | 11 | QPSK | 2 | 1/6 | 5000 | 24 | 2 | 2 | 26400 | 13200 |
|  | 25 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 25 | 15 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 25 | 15 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 30 | 15 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 30 | 15 | 80 | 11 | QPSK | 2 | 1/6 | 3976 | 24 | 2 | 2 | 21120 | 10560 |
|  | 30 | 15 | 160 | 11 | QPSK | 2 | 1/6 | 7944 | 24 | 2 | 3 | 42240 | 21120 |
|  | 40 | 15 | 108 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28512 | 14256 |
|  | 40 | 15 | 216 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57024 | 28512 |
|  | 50 | 15 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
|  | 50 | 15 | 270 | 11 | QPSK | 2 | 1/6 | 13320 | 24 | 2 | 4 | 71280 | 35640 |
| 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 TS 38.214 [10].  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.2.3.2-2: Reference channels for DFT-s-OFDM QPSK for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 30 | 5 | 11 | QPSK | 2 | 1/6 | 256 | 16 | 2 | 1 | 1320 | 660 |
|  | 5 | 30 | 10 | 11 | QPSK | 2 | 1/6 | 504 | 16 | 2 | 1 | 2640 | 1320 |
|  | 10 | 30 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 10 | 30 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 15 | 30 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 15 | 30 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 20 | 30 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 20 | 30 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 25 | 30 | 32 | 11 | QPSK | 2 | 1/6 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|  | 25 | 30 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 30 | 30 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 30 | 30 | 75 | 11 | QPSK | 2 | 1/6 | 3752 | 16 | 2 | 1 | 19800 | 9900 |
|  | 40 | 30 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 40 | 30 | 100 | 11 | QPSK | 2 | 1/6 | 5000 | 24 | 2 | 2 | 26400 | 13200 |
|  | 50 | 30 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 50 | 30 | 128 | 11 | QPSK | 2 | 1/6 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|  | 60 | 30 | 81 | 11 | QPSK | 2 | 1/6 | 4040 | 24 | 2 | 2 | 21384 | 10692 |
|  | 60 | 30 | 162 | 11 | QPSK | 2 | 1/6 | 8064 | 24 | 2 | 3 | 42768 | 21384 |
|  | 80 | 30 | 108 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28512 | 14256 |
|  | 80 | 30 | 216 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57024 | 28512 |
|  | 90 | 30 | 120 | 11 | QPSK | 2 | 1/6 | 5896 | 24 | 2 | 2 | 31680 | 15840 |
|  | 90 | 30 | 243 | 11 | QPSK | 2 | 1/6 | 12040 | 24 | 2 | 4 | 64152 | 32076 |
|  | 100 | 30 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
|  | 100 | 30 | 270 | 11 | QPSK | 2 | 1/6 | 13320 | 24 | 2 | 4 | 71280 | 35640 |
| 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 TS 38.214 [10].  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.2.3.2-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 10 | 60 | 5 | 11 | QPSK | 2 | 1/6 | 256 | 16 | 2 | 1 | 1320 | 660 |
|  | 10 | 60 | 10 | 11 | QPSK | 2 | 1/6 | 504 | 16 | 2 | 1 | 2640 | 1320 |
|  | 15 | 60 | 9 | 11 | QPSK | 2 | 1/6 | 456 | 16 | 2 | 1 | 2376 | 1188 |
|  | 15 | 60 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 20 | 60 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 20 | 60 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 25 | 60 | 15 | 11 | QPSK | 2 | 1/6 | 768 | 16 | 2 | 1 | 3960 | 1980 |
|  | 25 | 60 | 30 | 11 | QPSK | 2 | 1/6 | 1544 | 16 | 2 | 1 | 7920 | 3960 |
|  | 30 | 60 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 30 | 60 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 40 | 60 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 40 | 60 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 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 |
|  | 60 | 60 | 36 | 11 | QPSK | 2 | 1/6 | 1800 | 16 | 2 | 1 | 9504 | 4752 |
|  | 60 | 60 | 75 | 11 | QPSK | 2 | 1/6 | 3752 | 16 | 2 | 1 | 19800 | 9900 |
|  | 80 | 60 | 50 | 11 | QPSK | 2 | 1/6 | 2472 | 16 | 2 | 1 | 13200 | 6600 |
|  | 80 | 60 | 100 | 11 | QPSK | 2 | 1/6 | 5000 | 24 | 2 | 2 | 26400 | 13200 |
|  | 90 | 60 | 60 | 11 | QPSK | 2 | 1/6 | 3104 | 16 | 2 | 1 | 15840 | 7920 |
|  | 90 | 60 | 120 | 11 | QPSK | 2 | 1/6 | 5896 | 24 | 2 | 2 | 31680 | 15840 |
|  | 100 | 60 | 64 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|  | 100 | 60 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
| 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 TS 38.214 [10].  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.2.3.3 DFT-s-OFDM 16QAM

Table A.2.3.3-1: Reference channels for DFT-s-OFDM 16QAM for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 15 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 5 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 15 | 15 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 15 | 15 | 75 | 11 | 16QAM | 10 | 1/3 | 13064 | 24 | 1 | 2 | 39600 | 9900 |
|  | 20 | 15 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 20 | 15 | 100 | 11 | 16QAM | 10 | 1/3 | 17424 | 24 | 1 | 3 | 52800 | 13200 |
|  | 25 | 15 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 25 | 15 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 30 | 15 | 80 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42240 | 10560 |
|  | 30 | 15 | 160 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 84480 | 21120 |
|  | 40 | 15 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 40 | 15 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 50 | 15 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 50 | 15 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| 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 TS 38.214 [10].  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.2.3.3-2: Reference channels for DFT-s-OFDM 16QAM for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 30 | 5 | 11 | 16QAM | 10 | 1/3 | 888 | 16 | 2 | 1 | 2640 | 660 |
|  | 5 | 30 | 10 | 11 | 16QAM | 10 | 1/3 | 1800 | 16 | 2 | 1 | 5280 | 1320 |
|  | 10 | 30 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 10 | 30 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 15 | 30 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 15 | 30 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 20 | 30 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 20 | 30 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 25 | 30 | 32 | 11 | 16QAM | 10 | 1/3 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|  | 25 | 30 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 30 | 30 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 30 | 30 | 75 | 11 | 16QAM | 10 | 1/3 | 13064 | 24 | 1 | 2 | 39600 | 9900 |
|  | 40 | 30 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 40 | 30 | 100 | 11 | 16QAM | 10 | 1/3 | 17424 | 24 | 1 | 3 | 52800 | 13200 |
|  | 50 | 30 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 50 | 30 | 128 | 11 | 16QAM | 10 | 1/3 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|  | 60 | 30 | 81 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42768 | 10692 |
|  | 60 | 30 | 162 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 85536 | 21384 |
|  | 80 | 30 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 80 | 30 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 90 | 30 | 120 | 11 | 16QAM | 10 | 1/3 | 21000 | 24 | 1 | 3 | 63360 | 15840 |
|  | 90 | 30 | 243 | 11 | 16QAM | 10 | 1/3 | 43032 | 24 | 1 | 6 | 128304 | 32076 |
|  | 100 | 30 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 100 | 30 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| 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 TS 38.214 [10].  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.2.3.3-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 10 | 60 | 5 | 11 | 16QAM | 10 | 1/3 | 888 | 16 | 2 | 1 | 2640 | 660 |
|  | 10 | 60 | 10 | 11 | 16QAM | 10 | 1/3 | 1800 | 16 | 2 | 1 | 5280 | 1320 |
|  | 15 | 60 | 9 | 11 | 16QAM | 10 | 1/3 | 1608 | 16 | 2 | 1 | 4752 | 1188 |
|  | 15 | 60 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 20 | 60 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 20 | 60 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 25 | 60 | 15 | 11 | 16QAM | 10 | 1/3 | 2664 | 16 | 2 | 1 | 7920 | 1980 |
|  | 25 | 60 | 30 | 11 | 16QAM | 10 | 1/3 | 5248 | 24 | 1 | 1 | 15840 | 3960 |
|  | 30 | 60 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 30 | 60 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 40 | 60 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 40 | 60 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 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 |
|  | 60 | 60 | 36 | 11 | 16QAM | 10 | 1/3 | 6272 | 24 | 1 | 1 | 19008 | 4752 |
|  | 60 | 60 | 75 | 11 | 16QAM | 10 | 1/3 | 13064 | 24 | 1 | 2 | 39600 | 9900 |
|  | 80 | 60 | 50 | 11 | 16QAM | 10 | 1/3 | 8712 | 24 | 1 | 2 | 26400 | 6600 |
|  | 80 | 60 | 100 | 11 | 16QAM | 10 | 1/3 | 17424 | 24 | 1 | 3 | 52800 | 13200 |
|  | 90 | 60 | 60 | 11 | 16QAM | 10 | 1/3 | 10504 | 24 | 1 | 2 | 31680 | 7920 |
|  | 90 | 60 | 120 | 11 | 16QAM | 10 | 1/3 | 21000 | 24 | 1 | 3 | 63360 | 15840 |
|  | 100 | 60 | 64 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|  | 100 | 60 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
| 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 TS 38.214 [10].  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.2.3.4 DFT-s-OFDM 64QAM

Table A.2.3.4-1: Reference channels for DFT-s-OFDM 64QAM for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 64QAM | 18 | 1/2 | 9992 | 24 | 1 | 2 | 19800 | 3300 |
|  | 10 | 15 | 50 | 11 | 64QAM | 18 | 1/2 | 19968 | 24 | 1 | 3 | 39600 | 6600 |
|  | 15 | 15 | 75 | 11 | 64QAM | 18 | 1/2 | 30216 | 24 | 1 | 4 | 59400 | 9900 |
|  | 20 | 15 | 100 | 11 | 64QAM | 18 | 1/2 | 39936 | 24 | 1 | 5 | 79200 | 13200 |
|  | 25 | 15 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 30 | 15 | 160 | 11 | 64QAM | 18 | 1/2 | 63528 | 24 | 1 | 8 | 126720 | 21120 |
|  | 40 | 15 | 216 | 11 | 64QAM | 18 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 50 | 15 | 270 | 11 | 64QAM | 18 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| 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 TS 38.214 [10].  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.2.3.4-2: Reference channels for DFT-s-OFDM 64QAM for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 10 | 11 | 64QAM | 18 | 1/2 | 3968 | 24 | 1 | 1 | 7920 | 1320 |
|  | 10 | 30 | 24 | 11 | 64QAM | 18 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 15 | 30 | 36 | 11 | 64QAM | 18 | 1/2 | 14344 | 24 | 1 | 2 | 28512 | 4752 |
|  | 20 | 30 | 50 | 11 | 64QAM | 18 | 1/2 | 19968 | 24 | 1 | 3 | 39600 | 6600 |
|  | 25 | 30 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 30 | 30 | 75 | 11 | 64QAM | 18 | 1/2 | 30216 | 24 | 1 | 4 | 59400 | 9900 |
|  | 40 | 30 | 100 | 11 | 64QAM | 18 | 1/2 | 39936 | 24 | 1 | 5 | 79200 | 13200 |
|  | 50 | 30 | 128 | 11 | 64QAM | 18 | 1/2 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|  | 60 | 30 | 162 | 11 | 64QAM | 18 | 1/2 | 64552 | 24 | 1 | 8 | 128304 | 21384 |
|  | 80 | 30 | 216 | 11 | 64QAM | 18 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 90 | 30 | 243 | 11 | 64QAM | 18 | 1/2 | 96264 | 24 | 1 | 12 | 192456 | 32076 |
|  | 100 | 30 | 270 | 11 | 64QAM | 18 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| 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 TS 38.214 [10].  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.2.3.4-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 10 | 11 | 64QAM | 18 | 1/2 | 3968 | 24 | 1 | 1 | 7920 | 1320 |
|  | 15 | 60 | 18 | 11 | 64QAM | 18 | 1/2 | 7168 | 24 | 1 | 1 | 14256 | 2376 |
|  | 20 | 60 | 24 | 11 | 64QAM | 18 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 25 | 60 | 30 | 11 | 64QAM | 18 | 1/2 | 12040 | 24 | 1 | 2 | 23760 | 3960 |
|  | 30 | 60 | 36 | 11 | 64QAM | 18 | 1/2 | 14344 | 24 | 1 | 2 | 28512 | 4752 |
|  | 40 | 60 | 50 | 11 | 64QAM | 18 | 1/2 | 19968 | 24 | 1 | 3 | 39600 | 6600 |
|  | 50 | 60 | 64 | 11 | 64QAM | 18 | 1/2 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|  | 60 | 60 | 75 | 11 | 64QAM | 18 | 1/2 | 30216 | 24 | 1 | 4 | 59400 | 9900 |
|  | 80 | 60 | 100 | 11 | 64QAM | 18 | 1/2 | 39936 | 24 | 1 | 5 | 79200 | 13200 |
|  | 90 | 60 | 120 | 11 | 64QAM | 18 | 1/2 | 48168 | 24 | 1 | 6 | 95040 | 15840 |
|  | 100 | 60 | 135 | 11 | 64QAM | 18 | 1/2 | 54296 | 24 | 1 | 7 | 106920 | 17820 |
| 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 TS 38.214 [10].  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.2.3.5 DFT-s-OFDM 256QAM

Table A.2.3.5-1: Reference channels for DFT-s-OFDM 256QAM for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 256QAM | 20 | 2/3 | 17424 | 24 | 1 | 3 | 26400 | 3300 |
|  | 10 | 15 | 50 | 11 | 256QAM | 20 | 2/3 | 34816 | 24 | 1 | 5 | 52800 | 6600 |
|  | 15 | 15 | 75 | 11 | 256QAM | 20 | 2/3 | 53288 | 24 | 1 | 7 | 79200 | 9900 |
|  | 20 | 15 | 100 | 11 | 256QAM | 20 | 2/3 | 69672 | 24 | 1 | 9 | 105600 | 13200 |
|  | 25 | 15 | 128 | 11 | 256QAM | 20 | 2/3 | 90176 | 24 | 1 | 11 | 135168 | 16896 |
|  | 30 | 15 | 160 | 11 | 256QAM | 20 | 2/3 | 112648 | 24 | 1 | 14 | 168960 | 21120 |
|  | 40 | 15 | 216 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 228096 | 28512 |
|  | 50 | 15 | 270 | 11 | 256QAM | 20 | 2/3 | 188576 | 24 | 1 | 23 | 285120 | 35640 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.3.5-2: Reference channels for DFT-s-OFDM 256QAM for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 10 | 11 | 256QAM | 20 | 2/3 | 7040 | 24 | 1 | 1 | 10560 | 1320 |
|  | 10 | 30 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 15 | 30 | 36 | 11 | 256QAM | 20 | 2/3 | 25104 | 24 | 1 | 3 | 38016 | 4752 |
|  | 20 | 30 | 50 | 11 | 256QAM | 20 | 2/3 | 34816 | 24 | 1 | 5 | 52800 | 6600 |
|  | 25 | 30 | 64 | 11 | 256QAM | 20 | 2/3 | 45096 | 24 | 1 | 6 | 67584 | 8448 |
|  | 30 | 30 | 75 | 11 | 256QAM | 20 | 2/3 | 53288 | 24 | 1 | 7 | 79200 | 9900 |
|  | 40 | 30 | 100 | 11 | 256QAM | 20 | 2/3 | 69672 | 24 | 1 | 9 | 105600 | 13200 |
|  | 50 | 30 | 128 | 11 | 256QAM | 20 | 2/3 | 90176 | 24 | 1 | 11 | 135168 | 16896 |
|  | 60 | 30 | 162 | 11 | 256QAM | 20 | 2/3 | 114776 | 24 | 1 | 14 | 171072 | 21384 |
|  | 80 | 30 | 216 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 228096 | 28512 |
|  | 90 | 30 | 243 | 11 | 256QAM | 20 | 2/3 | 172176 | 24 | 1 | 21 | 256608 | 32076 |
|  | 100 | 30 | 270 | 11 | 256QAM | 20 | 2/3 | 188576 | 24 | 1 | 23 | 285120 | 35640 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.3.5-3: Reference channels for DFT-s-OFDM 256QAM 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 10 | 11 | 256QAM | 20 | 2/3 | 7040 | 24 | 1 | 1 | 10560 | 1320 |
|  | 15 | 60 | 18 | 11 | 256QAM | 20 | 2/3 | 12552 | 24 | 1 | 2 | 19008 | 2376 |
|  | 20 | 60 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 25 | 60 | 30 | 11 | 256QAM | 20 | 2/3 | 21000 | 24 | 1 | 3 | 31680 | 3960 |
|  | 30 | 60 | 36 | 11 | 256QAM | 20 | 2/3 | 25104 | 24 | 1 | 3 | 38016 | 4752 |
|  | 40 | 60 | 50 | 11 | 256QAM | 20 | 2/3 | 34816 | 24 | 1 | 5 | 52800 | 6600 |
|  | 50 | 60 | 64 | 11 | 256QAM | 20 | 2/3 | 45096 | 24 | 1 | 6 | 67584 | 8448 |
|  | 60 | 60 | 75 | 11 | 256QAM | 20 | 2/3 | 53288 | 24 | 1 | 7 | 79200 | 9900 |
|  | 80 | 60 | 100 | 11 | 256QAM | 20 | 2/3 | 69672 | 24 | 1 | 9 | 105600 | 13200 |
|  | 90 | 60 | 120 | 11 | 256QAM | 20 | 2/3 | 83976 | 24 | 1 | 10 | 126720 | 15840 |
|  | 100 | 60 | 135 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 142560 | 17820 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.3.6 CP-OFDM QPSK

Table A.2.3.6-1: Reference channels for CP-OFDM QPSK for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 15 | 13 | 11 | QPSK | 2 | 1/6 | 672 | 16 | 2 | 1 | 3432 | 1716 |
|  | 5 | 15 | 25 | 11 | QPSK | 2 | 1/6 | 1256 | 16 | 2 | 1 | 6600 | 3300 |
|  | 10 | 15 | 26 | 11 | QPSK | 2 | 1/6 | 1288 | 16 | 2 | 1 | 6864 | 3432 |
|  | 10 | 15 | 52 | 11 | QPSK | 2 | 1/6 | 2600 | 16 | 2 | 1 | 13728 | 6864 |
|  | 15 | 15 | 40 | 11 | QPSK | 2 | 1/6 | 2024 | 16 | 2 | 1 | 10560 | 5280 |
|  | 15 | 15 | 79 | 11 | QPSK | 2 | 1/6 | 3912 | 24 | 2 | 2 | 20856 | 10428 |
|  | 20 | 15 | 53 | 11 | QPSK | 2 | 1/6 | 2664 | 16 | 2 | 1 | 13992 | 6996 |
|  | 20 | 15 | 106 | 11 | QPSK | 2 | 1/6 | 5256 | 24 | 2 | 2 | 27984 | 13992 |
|  | 25 | 15 | 67 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17688 | 8844 |
|  | 25 | 15 | 133 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35112 | 17556 |
|  | 30 | 15 | 80 | 11 | QPSK | 2 | 1/6 | 3976 | 24 | 2 | 2 | 21120 | 10560 |
|  | 30 | 15 | 160 | 11 | QPSK | 2 | 1/6 | 7944 | 24 | 2 | 3 | 42240 | 21120 |
|  | 40 | 15 | 108 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28512 | 14256 |
|  | 40 | 15 | 216 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57024 | 28512 |
|  | 50 | 15 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
|  | 50 | 15 | 270 | 11 | QPSK | 2 | 1/6 | 13320 | 24 | 2 | 4 | 71280 | 35640 |
| 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 TS 38.214 [10].  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.2.3.6-2: Reference channels for CP-OFDM QPSK for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 5 | 30 | 6 | 11 | QPSK | 2 | 1/6 | 304 | 16 | 2 | 1 | 1584 | 792 |
|  | 5 | 30 | 11 | 11 | QPSK | 2 | 1/6 | 552 | 16 | 2 | 1 | 2904 | 1452 |
|  | 10 | 30 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 10 | 30 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 15 | 30 | 19 | 11 | QPSK | 2 | 1/6 | 984 | 16 | 2 | 1 | 5016 | 2508 |
|  | 15 | 30 | 38 | 11 | QPSK | 2 | 1/6 | 1928 | 16 | 2 | 1 | 10032 | 5016 |
|  | 20 | 30 | 26 | 11 | QPSK | 2 | 1/6 | 1288 | 16 | 2 | 1 | 6864 | 3432 |
|  | 20 | 30 | 51 | 11 | QPSK | 2 | 1/6 | 2536 | 16 | 2 | 1 | 13464 | 6732 |
|  | 25 | 30 | 33 | 11 | QPSK | 2 | 1/6 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|  | 25 | 30 | 65 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 17160 | 8580 |
|  | 30 | 30 | 39 | 11 | QPSK | 2 | 1/6 | 2024 | 16 | 2 | 1 | 10296 | 5148 |
|  | 30 | 30 | 78 | 11 | QPSK | 2 | 1/6 | 3848 | 24 | 2 | 2 | 20592 | 10296 |
|  | 40 | 30 | 53 | 11 | QPSK | 2 | 1/6 | 2664 | 16 | 2 | 1 | 13992 | 6996 |
|  | 40 | 30 | 106 | 11 | QPSK | 2 | 1/6 | 5256 | 24 | 2 | 2 | 27984 | 13992 |
|  | 50 | 30 | 67 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17688 | 8844 |
|  | 50 | 30 | 133 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35112 | 17556 |
|  | 60 | 30 | 81 | 11 | QPSK | 2 | 1/6 | 4040 | 24 | 2 | 2 | 21384 | 10692 |
|  | 60 | 30 | 162 | 11 | QPSK | 2 | 1/6 | 8064 | 24 | 2 | 3 | 42768 | 21384 |
|  | 80 | 30 | 109 | 11 | QPSK | 2 | 1/6 | 5384 | 24 | 2 | 2 | 28776 | 14388 |
|  | 80 | 30 | 217 | 11 | QPSK | 2 | 1/6 | 10752 | 24 | 2 | 3 | 57288 | 28644 |
|  | 90 | 30 | 123 | 11 | QPSK | 2 | 1/6 | 6152 | 24 | 2 | 2 | 32472 | 16236 |
|  | 90 | 30 | 245 | 11 | QPSK | 2 | 1/6 | 12296 | 24 | 2 | 4 | 64680 | 32340 |
|  | 100 | 30 | 137 | 11 | QPSK | 2 | 1/6 | 6792 | 24 | 2 | 2 | 36168 | 18084 |
|  | 100 | 30 | 273 | 11 | QPSK | 2 | 1/6 | 13576 | 24 | 2 | 4 | 72072 | 36036 |
| 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 TS 38.214 [10].  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.2.3.6-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | QPSK | 2 | 1/6 | 48 | 16 | 2 | 1 | 264 | 132 |
|  | 10 | 60 | 6 | 11 | QPSK | 2 | 1/6 | 304 | 16 | 2 | 1 | 1584 | 792 |
|  | 10 | 60 | 11 | 11 | QPSK | 2 | 1/6 | 552 | 16 | 2 | 1 | 2904 | 1452 |
|  | 15 | 60 | 9 | 11 | QPSK | 2 | 1/6 | 456 | 16 | 2 | 1 | 2376 | 1188 |
|  | 15 | 60 | 18 | 11 | QPSK | 2 | 1/6 | 928 | 16 | 2 | 1 | 4752 | 2376 |
|  | 20 | 60 | 12 | 11 | QPSK | 2 | 1/6 | 608 | 16 | 2 | 1 | 3168 | 1584 |
|  | 20 | 60 | 24 | 11 | QPSK | 2 | 1/6 | 1192 | 16 | 2 | 1 | 6336 | 3168 |
|  | 25 | 60 | 16 | 11 | QPSK | 2 | 1/6 | 808 | 16 | 2 | 1 | 4224 | 2112 |
|  | 25 | 60 | 31 | 11 | QPSK | 2 | 1/6 | 1544 | 16 | 2 | 1 | 8184 | 4092 |
|  | 30 | 60 | 19 | 11 | QPSK | 2 | 1/6 | 984 | 16 | 2 | 1 | 5016 | 2508 |
|  | 30 | 60 | 38 | 11 | QPSK | 2 | 1/6 | 1928 | 16 | 2 | 1 | 10032 | 5016 |
|  | 40 | 60 | 26 | 11 | QPSK | 2 | 1/6 | 1288 | 16 | 2 | 1 | 6864 | 3432 |
|  | 40 | 60 | 51 | 11 | QPSK | 2 | 1/6 | 2536 | 16 | 2 | 1 | 13464 | 6732 |
|  | 50 | 60 | 33 | 11 | QPSK | 2 | 1/6 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|  | 50 | 60 | 65 | 11 | QPSK | 2 | 1/6 | 3240 | 16 | 2 | 1 | 17160 | 8580 |
|  | 60 | 60 | 40 | 11 | QPSK | 2 | 1/6 | 2024 | 16 | 2 | 1 | 10560 | 5280 |
|  | 60 | 60 | 79 | 11 | QPSK | 2 | 1/6 | 3912 | 24 | 2 | 2 | 20856 | 10428 |
|  | 80 | 60 | 54 | 11 | QPSK | 2 | 1/6 | 2664 | 16 | 2 | 1 | 14256 | 7128 |
|  | 80 | 60 | 107 | 11 | QPSK | 2 | 1/6 | 5256 | 24 | 2 | 2 | 28248 | 14124 |
|  | 90 | 60 | 61 | 11 | QPSK | 2 | 1/6 | 3104 | 16 | 2 | 1 | 16104 | 8052 |
|  | 90 | 60 | 121 | 11 | QPSK | 2 | 1/6 | 6024 | 24 | 2 | 2 | 31944 | 15972 |
|  | 100 | 60 | 68 | 11 | QPSK | 2 | 1/6 | 3368 | 16 | 2 | 1 | 17952 | 8976 |
|  | 100 | 60 | 135 | 11 | QPSK | 2 | 1/6 | 6664 | 24 | 2 | 2 | 35640 | 17820 |
| 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 TS 38.214 [10].  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.2.3.7 CP-OFDM 16QAM

Table A.2.3.7-1: Reference channels for CP-OFDM 16QAM for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-50 | 15 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 15 | 13 | 11 | 16QAM | 10 | 1/3 | 2280 | 16 | 2 | 1 | 6864 | 1716 |
|  | 5 | 15 | 25 | 11 | 16QAM | 10 | 1/3 | 4352 | 24 | 1 | 1 | 13200 | 3300 |
|  | 10 | 15 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 10 | 15 | 52 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27456 | 6864 |
|  | 15 | 15 | 40 | 11 | 16QAM | 10 | 1/3 | 7040 | 24 | 1 | 1 | 21120 | 5280 |
|  | 15 | 15 | 79 | 11 | 16QAM | 10 | 1/3 | 13832 | 24 | 1 | 2 | 41712 | 10428 |
|  | 20 | 15 | 53 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27984 | 6996 |
|  | 20 | 15 | 106 | 11 | 16QAM | 10 | 1/3 | 18432 | 24 | 1 | 3 | 55968 | 13992 |
|  | 25 | 15 | 67 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35376 | 8844 |
|  | 25 | 15 | 133 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 70224 | 17556 |
|  | 30 | 15 | 80 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42240 | 10560 |
|  | 30 | 15 | 160 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 84480 | 21120 |
|  | 40 | 15 | 108 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57024 | 14256 |
|  | 40 | 15 | 216 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114048 | 28512 |
|  | 50 | 15 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
|  | 50 | 15 | 270 | 11 | 16QAM | 10 | 1/3 | 47112 | 24 | 1 | 6 | 142560 | 35640 |
| 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 TS 38.214 [10].  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.2.3.7-2: Reference channels for CP-OFDM 16QAM for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5-100 | 30 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 5 | 30 | 6 | 11 | 16QAM | 10 | 1/3 | 1064 | 16 | 2 | 1 | 3168 | 792 |
|  | 5 | 30 | 11 | 11 | 16QAM | 10 | 1/3 | 1928 | 16 | 2 | 1 | 5808 | 1452 |
|  | 10 | 30 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 10 | 30 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 15 | 30 | 19 | 11 | 16QAM | 10 | 1/3 | 3368 | 16 | 2 | 1 | 10032 | 2508 |
|  | 15 | 30 | 38 | 11 | 16QAM | 10 | 1/3 | 6656 | 24 | 1 | 1 | 20064 | 5016 |
|  | 20 | 30 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 20 | 30 | 51 | 11 | 16QAM | 10 | 1/3 | 8968 | 24 | 1 | 2 | 26928 | 6732 |
|  | 25 | 30 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 25 | 30 | 65 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 34320 | 8580 |
|  | 30 | 30 | 39 | 11 | 16QAM | 10 | 1/3 | 6784 | 24 | 1 | 1 | 20592 | 5148 |
|  | 30 | 30 | 78 | 11 | 16QAM | 10 | 1/3 | 13576 | 24 | 1 | 2 | 41184 | 10296 |
|  | 40 | 30 | 53 | 11 | 16QAM | 10 | 1/3 | 9224 | 24 | 1 | 2 | 27984 | 6996 |
|  | 40 | 30 | 106 | 11 | 16QAM | 10 | 1/3 | 18432 | 24 | 1 | 3 | 55968 | 13992 |
|  | 50 | 30 | 67 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35376 | 8844 |
|  | 50 | 30 | 133 | 11 | 16QAM | 10 | 1/3 | 23040 | 24 | 1 | 3 | 70224 | 17556 |
|  | 60 | 30 | 81 | 11 | 16QAM | 10 | 1/3 | 14088 | 24 | 1 | 2 | 42768 | 10692 |
|  | 60 | 30 | 162 | 11 | 16QAM | 10 | 1/3 | 28168 | 24 | 1 | 4 | 85536 | 21384 |
|  | 80 | 30 | 109 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 57552 | 14388 |
|  | 80 | 30 | 217 | 11 | 16QAM | 10 | 1/3 | 37896 | 24 | 1 | 5 | 114576 | 28644 |
|  | 90 | 30 | 123 | 11 | 16QAM | 10 | 1/3 | 21504 | 24 | 1 | 3 | 64944 | 16236 |
|  | 90 | 30 | 245 | 11 | 16QAM | 10 | 1/3 | 43032 | 24 | 1 | 6 | 129360 | 32340 |
|  | 100 | 30 | 137 | 11 | 16QAM | 10 | 1/3 | 24072 | 24 | 1 | 3 | 72336 | 18084 |
|  | 100 | 30 | 273 | 11 | 16QAM | 10 | 1/3 | 48168 | 24 | 1 | 6 | 144144 | 36036 |
| 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 TS 38.214 [10].  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.2.3.7-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10-100 | 60 | 1 | 11 | 16QAM | 10 | 1/3 | 176 | 16 | 2 | 1 | 528 | 132 |
|  | 10 | 60 | 6 | 11 | 16QAM | 10 | 1/3 | 1064 | 16 | 2 | 1 | 3168 | 792 |
|  | 10 | 60 | 11 | 11 | 16QAM | 10 | 1/3 | 1928 | 16 | 2 | 1 | 5808 | 1452 |
|  | 15 | 60 | 9 | 11 | 16QAM | 10 | 1/3 | 1608 | 16 | 2 | 1 | 4752 | 1188 |
|  | 15 | 60 | 18 | 11 | 16QAM | 10 | 1/3 | 3240 | 16 | 2 | 1 | 9504 | 2376 |
|  | 20 | 60 | 12 | 11 | 16QAM | 10 | 1/3 | 2088 | 16 | 2 | 1 | 6336 | 1584 |
|  | 20 | 60 | 24 | 11 | 16QAM | 10 | 1/3 | 4224 | 24 | 1 | 1 | 12672 | 3168 |
|  | 25 | 60 | 16 | 11 | 16QAM | 10 | 1/3 | 2792 | 16 | 2 | 1 | 8448 | 2112 |
|  | 25 | 60 | 31 | 11 | 16QAM | 10 | 1/3 | 5376 | 24 | 1 | 1 | 16368 | 4092 |
|  | 30 | 60 | 19 | 11 | 16QAM | 10 | 1/3 | 3368 | 16 | 2 | 1 | 10032 | 2508 |
|  | 30 | 60 | 38 | 11 | 16QAM | 10 | 1/3 | 6656 | 24 | 1 | 1 | 20064 | 5016 |
|  | 40 | 60 | 26 | 11 | 16QAM | 10 | 1/3 | 4480 | 24 | 1 | 1 | 13728 | 3432 |
|  | 40 | 60 | 51 | 11 | 16QAM | 10 | 1/3 | 8968 | 24 | 1 | 2 | 26928 | 6732 |
|  | 50 | 60 | 33 | 11 | 16QAM | 10 | 1/3 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|  | 50 | 60 | 65 | 11 | 16QAM | 10 | 1/3 | 11272 | 24 | 1 | 2 | 34320 | 8580 |
|  | 60 | 60 | 40 | 11 | 16QAM | 10 | 1/3 | 7040 | 24 | 1 | 1 | 21120 | 5280 |
|  | 60 | 60 | 79 | 11 | 16QAM | 10 | 1/3 | 13832 | 24 | 1 | 2 | 41712 | 10428 |
|  | 80 | 60 | 54 | 11 | 16QAM | 10 | 1/3 | 9480 | 24 | 1 | 2 | 28512 | 7128 |
|  | 80 | 60 | 107 | 11 | 16QAM | 10 | 1/3 | 18960 | 24 | 1 | 3 | 56496 | 14124 |
|  | 90 | 60 | 61 | 11 | 16QAM | 10 | 1/3 | 10760 | 24 | 1 | 2 | 32208 | 8052 |
|  | 90 | 60 | 121 | 11 | 16QAM | 10 | 1/3 | 21000 | 24 | 1 | 3 | 63888 | 15972 |
|  | 100 | 60 | 68 | 11 | 16QAM | 10 | 1/3 | 11784 | 24 | 1 | 2 | 35904 | 8976 |
|  | 100 | 60 | 135 | 11 | 16QAM | 10 | 1/3 | 23568 | 24 | 1 | 3 | 71280 | 17820 |
| 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 TS 38.214 [10].  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.2.3.8 CP-OFDM 64QAM

Table A.2.3.8-1: Reference channels for CP-OFDM 64QAM for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 64QAM | 19 | 1/2 | 9992 | 24 | 1 | 2 | 19800 | 3300 |
|  | 10 | 15 | 52 | 11 | 64QAM | 19 | 1/2 | 21000 | 24 | 1 | 3 | 41184 | 6864 |
|  | 15 | 15 | 79 | 11 | 64QAM | 19 | 1/2 | 31752 | 24 | 1 | 4 | 62568 | 10428 |
|  | 20 | 15 | 106 | 11 | 64QAM | 19 | 1/2 | 42016 | 24 | 1 | 5 | 83952 | 13992 |
|  | 25 | 15 | 133 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 105336 | 17556 |
|  | 30 | 15 | 160 | 11 | 64QAM | 19 | 1/2 | 63528 | 24 | 1 | 8 | 126720 | 21120 |
|  | 40 | 15 | 216 | 11 | 64QAM | 19 | 1/2 | 86040 | 24 | 1 | 11 | 171072 | 28512 |
|  | 50 | 15 | 270 | 11 | 64QAM | 19 | 1/2 | 108552 | 24 | 1 | 13 | 213840 | 35640 |
| 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 TS 38.214 [10].  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.2.3.8-2: Reference channels for CP-OFDM 64QAM for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 11 | 11 | 64QAM | 19 | 1/2 | 4352 | 24 | 1 | 1 | 8712 | 1452 |
|  | 10 | 30 | 24 | 11 | 64QAM | 19 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 15 | 30 | 38 | 11 | 64QAM | 19 | 1/2 | 15112 | 24 | 1 | 2 | 30096 | 5016 |
|  | 20 | 30 | 51 | 11 | 64QAM | 19 | 1/2 | 20496 | 24 | 1 | 3 | 40392 | 6732 |
|  | 25 | 30 | 65 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 51480 | 8580 |
|  | 30 | 30 | 78 | 11 | 64QAM | 19 | 1/2 | 31240 | 24 | 1 | 4 | 61776 | 10296 |
|  | 40 | 30 | 106 | 11 | 64QAM | 19 | 1/2 | 42016 | 24 | 1 | 5 | 83952 | 13992 |
|  | 50 | 30 | 133 | 11 | 64QAM | 19 | 1/2 | 53288 | 24 | 1 | 7 | 105336 | 17556 |
|  | 60 | 30 | 162 | 11 | 64QAM | 19 | 1/2 | 64552 | 24 | 1 | 8 | 128304 | 21384 |
|  | 80 | 30 | 217 | 11 | 64QAM | 19 | 1/2 | 86040 | 24 | 1 | 11 | 171864 | 28644 |
|  | 90 | 30 | 245 | 11 | 64QAM | 19 | 1/2 | 98376 | 24 | 1 | 12 | 194040 | 32340 |
|  | 100 | 30 | 273 | 11 | 64QAM | 19 | 1/2 | 108552 | 24 | 1 | 13 | 216216 | 36036 |
| 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 TS 38.214 [10].  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.2.3.8-3: 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 11 | 11 | 64QAM | 19 | 1/2 | 4352 | 24 | 1 | 1 | 8712 | 1452 |
|  | 15 | 60 | 18 | 11 | 64QAM | 19 | 1/2 | 7168 | 24 | 1 | 1 | 14256 | 2376 |
|  | 20 | 60 | 24 | 11 | 64QAM | 19 | 1/2 | 9480 | 24 | 1 | 2 | 19008 | 3168 |
|  | 25 | 60 | 31 | 11 | 64QAM | 19 | 1/2 | 12296 | 24 | 1 | 2 | 24552 | 4092 |
|  | 30 | 60 | 38 | 11 | 64QAM | 19 | 1/2 | 15112 | 24 | 1 | 2 | 30096 | 5016 |
|  | 40 | 60 | 51 | 11 | 64QAM | 19 | 1/2 | 20496 | 24 | 1 | 3 | 40392 | 6732 |
|  | 50 | 60 | 65 | 11 | 64QAM | 19 | 1/2 | 26120 | 24 | 1 | 4 | 51480 | 8580 |
|  | 60 | 60 | 79 | 11 | 64QAM | 19 | 1/2 | 31752 | 24 | 1 | 4 | 62568 | 10428 |
|  | 80 | 60 | 107 | 11 | 64QAM | 19 | 1/2 | 43032 | 24 | 1 | 6 | 84744 | 14124 |
|  | 90 | 60 | 121 | 11 | 64QAM | 19 | 1/2 | 48168 | 24 | 1 | 6 | 95832 | 15972 |
|  | 100 | 60 | 135 | 11 | 64QAM | 19 | 1/2 | 54296 | 24 | 1 | 7 | 106920 | 17820 |
| 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 TS 38.214 [10].  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.2.3.9 CP-OFDM 256QAM

Table A.2.3.9-1: Reference channels for CP-OFDM 256QAM for 15 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 slots 4 and 9 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 4 and 9 (Note 3) | Total number of bits per slot for slots 4 and 9 | Total modulated symbols per slot for slots 4 and 9 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 15 | 25 | 11 | 256QAM | 20 | 2/3 | 17424 | 24 | 1 | 3 | 26400 | 3300 |
|  | 10 | 15 | 52 | 11 | 256QAM | 20 | 2/3 | 36896 | 24 | 1 | 5 | 54912 | 6864 |
|  | 15 | 15 | 79 | 11 | 256QAM | 20 | 2/3 | 55304 | 24 | 1 | 7 | 83424 | 10428 |
|  | 20 | 15 | 106 | 11 | 256QAM | 20 | 2/3 | 73776 | 24 | 1 | 9 | 111936 | 13992 |
|  | 25 | 15 | 133 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 140448 | 17556 |
|  | 30 | 15 | 160 | 11 | 256QAM | 20 | 2/3 | 112648 | 24 | 1 | 14 | 168960 | 21120 |
|  | 40 | 15 | 216 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 228096 | 28512 |
|  | 50 | 15 | 270 | 11 | 256QAM | 20 | 2/3 | 188576 | 24 | 1 | 23 | 285120 | 35640 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.3.9-2: Reference channels for CP-OFDM 256QAM for 30 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 slots 8, 9, 18 and 19 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 8, 9, 18 and 19 (Note 3) | Total number of bits per slot for slots 8, 9, 18 and 19 | Total modulated symbols per slot for slots 8, 9, 18 and 19 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 5 | 30 | 11 | 11 | 256QAM | 20 | 2/3 | 7680 | 24 | 1 | 1 | 11616 | 1452 |
|  | 10 | 30 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 15 | 30 | 38 | 11 | 256QAM | 20 | 2/3 | 26632 | 24 | 1 | 4 | 40128 | 5016 |
|  | 20 | 30 | 51 | 11 | 256QAM | 20 | 2/3 | 35856 | 24 | 1 | 5 | 53856 | 6732 |
|  | 25 | 30 | 65 | 11 | 256QAM | 20 | 2/3 | 46104 | 24 | 1 | 6 | 68640 | 8580 |
|  | 30 | 30 | 78 | 11 | 256QAM | 20 | 2/3 | 55304 | 24 | 1 | 7 | 82368 | 10296 |
|  | 40 | 30 | 106 | 11 | 256QAM | 20 | 2/3 | 73776 | 24 | 1 | 9 | 111936 | 13992 |
|  | 50 | 30 | 133 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 140448 | 17556 |
|  | 60 | 30 | 162 | 11 | 256QAM | 20 | 2/3 | 114776 | 24 | 1 | 14 | 171072 | 21384 |
|  | 80 | 30 | 217 | 11 | 256QAM | 20 | 2/3 | 151608 | 24 | 1 | 18 | 229152 | 28644 |
|  | 90 | 30 | 245 | 11 | 256QAM | 20 | 2/3 | 172176 | 24 | 1 | 21 | 258720 | 32340 |
|  | 100 | 30 | 273 | 11 | 256QAM | 20 | 2/3 | 192624 | 24 | 1 | 23 | 288288 | 36036 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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.2.3.9-3: Reference channels for CP-OFDM 256QAM 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 slots 16, 17, 18, 19, 36, 37, 38 and 39 | Transport block CRC | LDPC Base Graph | Number of code blocks per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 (Note 3) | Total number of bits per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 | Total modulated symbols per slot for slots 16, 17, 18, 19, 36, 37, 38 and 39 |
| Unit | MHz | KHz |  |  |  |  |  | Bits | Bits |  |  | Bits |  |
|  | 10 | 60 | 11 | 11 | 256QAM | 20 | 2/3 | 7680 | 24 | 1 | 1 | 11616 | 1452 |
|  | 15 | 60 | 18 | 11 | 256QAM | 20 | 2/3 | 12552 | 24 | 1 | 2 | 19008 | 2376 |
|  | 20 | 60 | 24 | 11 | 256QAM | 20 | 2/3 | 16896 | 24 | 1 | 3 | 25344 | 3168 |
|  | 25 | 60 | 31 | 11 | 256QAM | 20 | 2/3 | 22032 | 24 | 1 | 3 | 32736 | 4092 |
|  | 30 | 60 | 38 | 11 | 256QAM | 20 | 2/3 | 26632 | 24 | 1 | 4 | 40128 | 5016 |
|  | 40 | 60 | 51 | 11 | 256QAM | 20 | 2/3 | 35856 | 24 | 1 | 5 | 53856 | 6732 |
|  | 50 | 60 | 65 | 11 | 256QAM | 20 | 2/3 | 46104 | 24 | 1 | 6 | 68640 | 8580 |
|  | 60 | 60 | 79 | 11 | 256QAM | 20 | 2/3 | 55304 | 24 | 1 | 7 | 83424 | 10428 |
|  | 80 | 60 | 107 | 11 | 256QAM | 20 | 2/3 | 75792 | 24 | 1 | 9 | 112992 | 14124 |
|  | 90 | 60 | 121 | 11 | 256QAM | 20 | 2/3 | 86040 | 24 | 1 | 11 | 127776 | 15972 |
|  | 100 | 60 | 135 | 11 | 256QAM | 20 | 2/3 | 94248 | 24 | 1 | 12 | 142560 | 17820 |
| 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 5.1.3.1-2 defined in TS 38.214 [10].  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) | | | | | | | | | | | | | |

### <End of Change 1>