IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Alternative MCS12 and MCS13 Text | | | | |
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Abstract

Draft text to provide support for alternative MCS 12 and 13.

*Instruct the Editor to modify the IEEE 802.11ay draft as shown in this document.*

* + 1. EDMG STA

*Add to Section 4.3.1*

-- Optional support for alternative SC MCS12 and MCS13 using 8-PSK Modulation

* + - 1. EDMG Capabilities element
         1. General

*Make the following changes:*

The Core Capabilities field is defined in Figure 18.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B6 | B7 B18 | B19 B21 | B22 B23 |
|  | A-MPDU Parameters | TRN Parameters | Supported MCS | Reserved |
| Bits: | 7 | 12 | 3 | 2 |

1. —Core Capabilities field format

The Supported MCS field is defined in Figure 21.

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 | B1 | B2 |
|  | NUC TX Supported | NUC RX Supported | π/2-8-PSK Supported |
| Bits: | 1 | 1 | 1 |

1. —Supported MCS field format

*Add the following text after Figure 21:*

The 8-PSK supported sub-field is set to one to indicate that the STA supports SC MCS12 and SC MCS13 using 8-PSK modulation.

1. * 1. Introduction to the EDMG PHY

*Add to Section 30.1.1* An EDMG STA may support the following features:

-- 8-PSK Modulation for SC MCS12 and MCS13

Definition for EDMG SC mode and EDMG OFDM mode PPDUs

*Modify Table 24 as follows:*

**EDMG-Header-A field structure and definition for a SU PPDU**

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | **Number of bits** | **Start bit** | **Description** |
| SU/MU Format | 1 | 0 | Indicates whether the PPDU is a SU PPDU or a MU PPDU. Set to 0 to indicate a SU PPDU and set to 1 otherwise. |
| Channel Aggregation | 1 | 1 | Set to 0 to indicate that the BW field specifies a 2.16 GHz, 4.32 GHz, 6.48 GHz or 8.64 GHz channel PPDU. Set to 1 to indicate that the BW field specifies a 2.16+2.16 GHz or 4.32+4.32 GHz PPDU. |
| BW | 8 | 2 | A bitmap constructed from the CH\_BANDWIDTH parameter in the TXVECTOR and that indicates the 2.16 GHz channel(s) over which the PPDU is transmitted on. If a bit is set to 1, it indicates that the corresponding channel is used for the PPDU transmission; otherwise if the bit is set to 0, the channel is not used. Bit 0 corresponds to channel 1, bit 1 corresponds to channel 2, and so on. |
| Primary Channel Number | 3 | 10 | Contains the 3 LSBs of the primary channel number of the BSS minus one |
| Beamformed | 1 | 13 | Set to 1 to indicate that channel estimate smoothing is recommended. Set to 0 otherwise. |
| Short/Long LDPC | 1 | 14 | Indicates the LDPC codeword length used in the PSDU. Set to 0 for LDPC codeword of length 672. Set to 1 for LDPC codeword of length 1344. |
| STBC Applied | 1 | 15 | If set to 1, indicates that STBC was applied at the transmitter. Otherwise, set to 0. |
| PSDU Length | 22 | 16 | Length of the PSDU field in octets. |
| Number of SS | 3 | 38 | The value of this field plus one indicates the number of SSs transmitted in the PPDU. |
| EDMG-MCS | 21 | 41 | If the number of SSs, as indicated by the Number of SS field, is 4 or less, the EDMG-MCS field is as defined in **Error! Reference source not found.**. Otherwise, the EDMG-MCS field is as defined in **Error! Reference source not found.**. |
| DCM SQPSK Applied | 1 | 62 | If set to 1, indicates that DCM SQPSK (**Error! Reference source not found.**) was applied at the transmitter. Otherwise, set to 0. |
| NUC Applied | 1 | 63 | If this field is set to 1, NUC is applied at the transmitter for all MCSs indicated within the EDMG-MCS field and that support NUC. If a MCS indicated within the EDMG-MCS field does not support NUC, uniform constellation is applied for this particular MCS.  If set to 0, uniform constellation is applied for all MCSs signalled in EDMG-MCS field. |
| EDMG TRN Length | 8 | 64 | Indicates the number of TRN-Units present in the TRN field of the PPDU. |
| RX TRN-Units per Each TX TRN-Unit | 8 | 72 | This field is reserved if the value of the EDMG TRN Length field is 0. Otherwise, the value of this field plus one indicates the number of consecutive TRN-Units in the TRN field for which the transmitter remains with the same transmit AWV (see **Error! Reference source not found.**). |
| EDMG TRN-Unit P | 2 | 80 | For EDMG BRP-TX and EDMG BRP-RX/TX packets, the value of this field describes the number of TRN subfields in a TRN-Unit which are transmitted using the same AWV, which is the same AWV used in the transmission of the preamble and Data field except for the case when the DMG antenna used in the transmission of the packet changes at the beginning of the TRN field, as defined in **Error! Reference source not found.**. Possible values for this field are:   * 0: indicates zero TRN subfields * 1: indicates one TRN subfield * 2: indicates two TRN subfields * 3: indicates four TRN subfields   For EDMG BRP-RX packets, this field is reserved. |
| EDMG TRN-Unit M | 4 | 82 | For EDMG BRP-TX packets, the value of this field plus one indicates the number of TRN subfields in a TRN-Unit in which the transmitter may change AWV at the beginning of each TRN subfield transmission, as defined in **Error! Reference source not found.**. For EDMG BRP-RX/TX packets, the value of this field plus one indicates the number of TRN subfields in a TRN-Unit transmitted with the same AWV following a possible AWV change, as defined in **Error! Reference source not found.**.  For EDMG BRP-RX packets, this field is reserved. For EDMG BRP-TX packets transmitted with EDMG Beam Tracking Request Type field set to 1, this field is reserved. |
| EDMG TRN-Unit N | 2 | 86 | For EDMG BRP-TX packets, the value of this field indicates the number of consecutive TRN subfields within EDMG TRN-Unit M which are transmitted using the same AWV, as defined in **Error! Reference source not found.**. Possible values for this field are:   * 0: indicates one TRN subfield * 1: indicates two TRN subfields * 2: indicates three TRN subfields if EDMG TRN-Unit M is equal to 2, 5, 8, 11 or 14; indicates eight TRN subfields if EDMG TRN-Unit M is equal to 7 or 15. * 3: indicates four TRN subfields   For EDMG BRP-RX and EDMG BRP-RX/TX packets, this field is reserved. For EDMG BRP-TX packets transmitted with EDMG Beam Tracking Request Type field set to 1, this field is reserved. |
| TRN Subfield Sequence Length | 2 | 88 | This field is reserved if the value of the EDMG TRN Length field is 0. Otherwise, this field indicates the length of the Golay sequence used to transmit the TRN subfields present in the TRN field of the PPDU and is set as follows:  Set to 0 to indicate normal sequence length of 128× *NCB*  Set to 1 to indicate long sequence length of 256× *NCB*  Set to 2 to indicate short sequence length of 64× *NCB*  Value 3 is reserved  *NCB* represents the integer number of contiguous 2.16 GHz channels over which the TRN subfield is transmitted and 1 ≤ *NCB* ≤ 4. |
| TRN-Unit RX Pattern | 1 | 90 | If set to 1 in a BRP-TX packet, indicates that the measurements of the TRN-Units is to be done using a quasi-omni antenna pattern. Otherwise if set to 0 in a BRP-TX packet, indicates that the measurements of the TRN-Units is to be done using a directional AWV receive antenna configuration. For all other cases, this field is reserved. |
| EDMG Beam Tracking Request | 1 | 91 | Corresponds to the TXVECTOR parameter EDMG\_BEAM\_TRACKING\_REQUEST.  Set to 1 to indicate the need for beam tracking (**Error! Reference source not found.**); otherwise, set to 0.  The EDMG Beam Tracking Request field is reserved when the EDMG TRN Length field is 0. |
| EDMG Beam Tracking Request Type | 1 | 92 | Corresponds to the TXVECTOR parameter EDMG\_BEAM\_TRACKING\_TYPE.  Set to 0 to indicate analog beam tracking (**Error! Reference source not found.**); set to 1 to indicate baseband beam tracking (**Error! Reference source not found.**).  This field is reserved when the EDMG Beam Tracking Request field is reserved. |
| Phase Hopping | 1 | 93 | If set to 1 in an EDMG OFDM mode PPDU, this field indicates that phase hopping is used. Otherwise this field is set to 0. This field is reserved in an EDMG SC mode PPDU, or if the transmitter or receiver do not support phase hopping. |
| Open Loop Precoding | 1 | 94 | If the Phase Hopping field is set to 1, this field indicates if open loop precoding is used. If this field is 1, open loop precoding is used. Otherwise, open loop precoding is not used. If the Phase Hopping field is reserved, this field is also reserved. |
| Additional EDMG PPDU | 1 | 95 | A value of 1 indicates that this EDMG PPDU is immediately followed by another EDMG PPDU with no IFS or preamble in between the PPDUs. A value of 0 indicates that no additional EDMG PPDU follows this EDMG PPDU. |
| π/2-8-PSK Applied | 1 | 96 | If this field is set to 1, π/2-8-PSK with corresponding LDPC shortening code with rates 2/3 and 5/6 is applied at the transmitter for MCS 12 and 13 accordingly indicated within the EDMG-MCS field.  If set to 0, π/2-16-QAM constellation with regular LDPC code with rates ½ and 5/8 is applied accordingly for MCS 12 and 13 signalled in EDMG-MCS field. |
| Reserved | 15 | 97 | Set to 0 by the transmitter and ignored by the receiver. |
| CRC | 16 | 112 | Header Check sequence. Calculation of the header check sequence is defined in 20.3.7. |

**30.5.7 Modulation and coding scheme (MCS)**

*Add a note below Table 47and additional text as follows:*

1. —EDMG-MCSs for the EDMG SC mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EDMG-MCS index | Modulation | NCBPS | Repetition | Code Rate | Data rate per spatial stream (Mbps) | | |
| Normal GI | Short GI | Long GI |
| 1 | π/2-BPSK | 1 | 2 | 1/2 | *NCB*×385.00 | *NCB*×412.50 | *NCB*×330.00 |
| 2 | π/2-BPSK | 1 | 1 | 1/2 | *NCB*×770.00 | *NCB*×825.00 | *NCB*×660.00 |
| 3 | π/2-BPSK | 1 | 1 | 5/8 | *NCB*×962.50 | *NCB*×1031.25 | *NCB*×825.00 |
| 4 | π/2-BPSK | 1 | 1 | 3/4 | *NCB*×1155.00 | *NCB*×1237.50 | *NCB*×990.00 |
| 5 | π/2-BPSK | 1 | 1 | 13/16 | *NCB*×1251.25 | *NCB*×1340.63 | *NCB*×1072.50 |
| 6 | π/2-BPSK | 1 | 1 | 7/8 | *NCB*×1347.50 | *NCB*×1443.75 | *NCB*×1155.00 |
| 7 | π/2-QPSK | 2 | 1 | 1/2 | *NCB*×1540.00 | *NCB*×1650.00 | *NCB*×1320.00 |
| 8 | π/2-QPSK | 2 | 1 | 5/8 | *NCB*×1925.00 | *NCB*×2062.50 | *NCB*×1650.00 |
| 9 | π/2-QPSK | 2 | 1 | 3/4 | *NCB*×2310.00 | *NCB*×2475.00 | *NCB*×1980.00 |
| 10 | π/2-QPSK | 2 | 1 | 13/16 | *NCB*×2502.50 | *NCB*×2681.25 | *NCB*×2145.00 |
| 11 | π/2-QPSK | 2 | 1 | 7/8 | *NCB*×2695.00 | *NCB*×2887.50 | *NCB*×2310.00 |
| 12 | π/2-16QAM | 4 | 1 | 1/2 | *NCB*×3080.00 | *NCB*×3300.00 | *NCB*×2640.00 |
| 13 | π/2-16QAM | 4 | 1 | 5/8 | *NCB*×3850.00 | *NCB*×4125.00 | *NCB*×3300.00 |
| 14 | π/2-16QAM | 4 | 1 | 3/4 | *NCB*×4620.00 | *NCB*×4950.00 | *NCB*×3960.00 |
| 15 | π/2-16QAM | 4 | 1 | 13/16 | *NCB*×5005.00 | *NCB*×5362.50 | *NCB*×4290.00 |
| 16 | π/2-16QAM | 4 | 1 | 7/8 | *NCB*×5390.00 | *NCB*×5775.00 | *NCB*×4620.00 |
| 17 | π/2-64QAM | 6 | 1 | 5/8 | *NCB*×5775.00 | *NCB*×6187.50 | *NCB*×4950.00 |
| 18 | π/2-64QAM | 6 | 1 | 3/4 | *NCB*×6930.00 | *NCB*×7425.00 | *NCB*×5940.00 |
| 19 | π/2-64QAM | 6 | 1 | 13/16 | *NCB*×7507.50 | *NCB*×8043.75 | *NCB*×6435.00 |
| 20 | π/2-64QAM | 6 | 1 | 7/8 | *NCB*×8085.00 | *NCB*×8662.50 | *NCB*×6930.00 |

If π/2-8-PSK Applied bit is set to 1, then MCS 12 and 13 shall use π/2-8-PSK modulation with LDPC encoding rates 2/3 and 5/6 accordingly as defined in Table 2.

1. —EDMG-MCSs 12 and 13 for the EDMG SC mode if π/2-8-PSK Applied bit set to 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EDMG-MCS index | Modulation | NCBPS | Repetition | Code Rate | Data rate per spatial stream (Mbps) | | |
| Normal GI | Short GI | Long GI |
| 12 | π/2-8-PSK | 3 | 1 | 2/3 | *NCB*×3080.00 | *NCB*×3300.00 | *NCB*×2640.00 |
| 13 | π/2-8-PSK | 3 | 1 | 5/6 | *NCB*×3850.00 | *NCB*×4125.00 | *NCB*×3300.00 |

Instruct the Editor to modify the text below as shown:

* 1. + 1. Encoding
          1. General

An EDMG SC mode PSDU is encoded by a systematic LDPC block code. Each data word of LCWD information bits is concatenated with LCWP parity bits to create a codeword of total length LCW = LCWD + LCWP bits. The EDMG LDPC encoding can employ the codeword lengths LCW = 468, 504, 624, 672, 936, 1008, 1248, and 1344 and code rates R = ½, 5/8, 2/3, ¾, 13/16, 5/6, and 7/8. The set of code rates is defined in **Error! Reference source not found.**.

1. —LDPC code rates

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code rate | Codeword size (LCW) | | Number of data bits (LCWD) | |
| Short | Long | Short | Long |
| ½ | 672 | 1344 | 336 | 672 |
| 5/8 | 672 | 1344 | 420 | 840 |
| 2/3 | 504 | 1008 | 336 | 672 |
| ¾ | 672 | 1344 | 504 | 1008 |
| 13/16 | 672 | 1344 | 546 | 1092 |
| 5/6 | 468 or 504 | 936 or 1008 | 390 or 420 | 780 or 840 |
| 7/8 | 624 or 672 | 1248 or 1344 | 546 or 588 | 1092 or 1176 |

The LDPC encoding with codeword length LCW = 672 and 1344 is performed by solving the linear system of equations  defined by the parity matrix H of size LCWP by LCW, where  defines the mth LDPC codeword,  defines the mth data word, and  defines parity bits for mth LDPC codeword.

The LDPC encoding with codeword length LCW = 624 and 1248 employs the original matrices H with LCW = 672 and 1344 for code rate R = 13/16, and then applies a puncturing procedure to get to a desired code rate R = 7/8. For LCW = 624, first 48 parity bits are discarded; for LCW = 1248, first 96 parity bits are discarded.

The LDPC encoding for code rate 2/3 with codeword length LCW = 504 and 1008 employs the original matrices H with LCW = 672 and 1344 for code rate R = 3/4, and then applies a shortening procedure to get to a desired code rate R = 2/3. For LCW = 504, 168 zeros are appended to 336 data bits before encoding; for LCW = 1008, 336 zeros are appended to 672 data bits before encoding. After encoding the zero bits are discareded and not transmitted.

The LDPC encpding for code rate 5/6 with codeword length *LCW* = 504 and 1008 employs the original matrices **H** with *LCW* = 672 and 1344 for code rate *R* = 7/8. For *LCW* = 504, 168 zeros are appended to 420 data bits before encoding; for *LCW* = 1008, 336 zeros are appended to 840 data bits before encoding. After encoding, the zero bits are discarded and not transmitted.

The LDPC encpding for code rate 5/6 with codeword length *LCW* = 468 and 936 employs the original matrices **H** with *LCW* = 672 and 1344 for code rate *R* = 13/16. For *LCW* = 468, 156 zeros are appended to 390 data bits before encoding; for *LCW* = 936, 312 zeros are appended to 780 data bits before encoding. After encoding, the zero bits are discarded; for *LCW* = 468, first 48 parity bits are discarded (punctured); for *LCW* = 936, the first 96 parity bits are discarded and not transmitted.The symbol notations for frequently used parameters in this subclause are summarized in Table 54.

1. —Frequently used parameters

|  |  |
| --- | --- |
| Symbol | Explanation |
|  | Spatial stream number |
|  | Total number of spatial streams for *iuser*-th user |
|  | User number |
|  | Total number of users |
|  | Space-time stream number for *iuser*-th user |
|  | Total number of space-time streams for *iuser*-th user |
|  | Space-time stream number over all users |
|  | Total number of space-time streams over all users |
|  | PSDU length in octets for *iuser*-th user |
|  | LDPC codeword length in bits, it can be equal to 468, 504, 624, 672, 936, 1008, 1248, and 1344 |
|  | LDPC codeword length in bits for *iuser*th user |
|  | Number of systematic data bits per LDPC codeword |
|  | Number of parity bits per LDPC codeword |
|  | Repetition factor for *iuser*th user; is equal to 2 for MCS 1 and equal to 1 for all other MCSs |
|  | Repetition factor for *iuser*th user and *iSS*-th spatial stream; is equal to 2 for MCS 1 and equal to 1 for all other MCSs |
|  | Shortening factor for *iuser*th user and *iSS*-th spatial stream; is equal to 1/4 if π/2-8-PSK Applied bit is set to 1 and equal to 0 otherwise |
|  | LDPC code rate for *iuser*th user and *iSS*th spatial stream; can be equal to ½, 5/8, 2/3, ¾, 13/16, 5/6, 7/8 |
|  | Total number of LDPC codewords for *iuser*th user |
|  | Total number of LDPC codewords for *iuser*th user and *iSS*th spatial stream |
|  | Number of pad bits for the *iuser*th user to reach an integer number of LDPC codewords |
|  | Total number of SC symbol blocks for the *iuser*th user |
|  | Minimum number of total SC symbol blocks for BRP PPDU transmission |
|  | Number of pad bits for the *iuser*th user to reach an integer number of SC symbol blocks |
|  | Number of pad bits for the *iuser*th user and *iSS*th spatial stream to reach an integer number of SC symbol blocks |
|  | Number of contiguous 2.16 GHz channels used for PPDU transmission |
|  | Number of coded bits per SC symbol block for the *iuser*th user; depends on modulation type and is different for different GI types as defined in Table 55. |
|  | Number of coded bits per symbol (constellation point) for the *iuser*th user and *iSS*th spatial stream |
|  | Number of bits in the group for *iuser*th user and *iSS*th spatial stream in the round robin distribution procedure |
|  | Number of symbols (constellation points) per SC symbol block; depends on the GI type as defined in Table 56. |
|  | Total number of users in a multi user transmission |
|  | Maximum number of SC symbol blocks over all users |
|  | The number of pad SC symbol blocks for the *iuser*th user that is required to align PPDUs over different users in time |

Table 55 defines the number of coded bits per SC symbol block, NCBPB, for different types of GI.

1. — Values of NCBPB for different types of GI

|  |  |  |  |
| --- | --- | --- | --- |
| Symbol mapping | Short GI | Normal GI | Long GI |
| π/2-BPSK | 480 | 448 | 384 |
| π/2-QPSK | 960 | 896 | 768 |
| π/2-8-PSK | 1440 | 1344 | 1152 |
| π/2-16QAM | 1920 | 1792 | 1536 |
| π/2-64QAM/64-NUC | 2880 | 2688 | 2304 |

Table 56 defines the number of symbols (constellation points) per SC symbol block, NSPB, for different types of GI.

1. — Values of NSPB for different types of GI

|  |  |  |
| --- | --- | --- |
| Short GI | Normal GI | Long GI |
| 480 | 448 | 384 |

* + - * 1. Parity check matrices

See **Error! Reference source not found.**.

*Editor: replace 30.5.8.4.3 defined in D0.5 with 30.5.8.4.3 proposed in this document below, remove 30.5.8.4.4 defined in D0.5*

* + - * 1. LDPC encoding

This subclause defines a SC mode EDMG SU PSDU or MU PSDU per user basis encoding. The LDPC encoding may employ codeword lengths LCW = 468, 504, 624, 672, 936, 1008, 1248, or 1344 and code rates R = ½, 5/8, 2/3, ¾, 13/16, 5/6, or 7/8.

The LDPC encoding process for the iuserth user shall be as follows:

1. Compute the number of data pad bits , using the number of bits in the group  and the number of LDPC codewords :







The scrambled PSDU is concatenated with  zero bits. They are scrambled using the continuation of the scrambler sequence that scrambled the PSDU input bits.

1. Distribute the PSDU scrambled bits over  spatial streams. Bits distribution is performed on the group basis, in that case the  bits come to the *iSS*-th spatial stream. The first group of bits comes to the first stream, the second group of bits comes to the second stream and so on. The procedure is repeated when the maximum number of spatial streams  is reached. If the number of codewords  are filled with the distributed data groups, then this stream is skipped during the next cycle of round robin distribution. The procedure ends up when all PSDU bits including  pad bits are distributed over the  spatial streams.
2. For each spatial stream convert the scrambled PSDU bits to LDPC codewords as follows:
   1. If ρ = 1 and *LCW* = 672, 1344:
      1. The output stream of scrambler is broken into the blocks of length *LCWD* = *LCW*×*R* bits such that the *m*-th data word is 
      2. To each data word, parity bits , *LCWP* = *LCW* - *LCWD*, are added to create the codeword  such that 
   2. If ρ = 1 and *LCW* = 624, *R* = 7/8:
      1. The output stream of scrambler is broken into the blocks of length 546 bits such that the *m*-th data word is 
      2. To each data word, parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 672, *R* = 13/16 LDPC matrix
      3. Finally, the first 48 parity bits are discarded (punctured) to create the output codeword 
   3. If ρ = 1 and *LCW* = 1248, *R* = 7/8:
      1. The output stream of scrambler is broken into the blocks of length 1092 bits such that the *m*-th data word is 
      2. To each data word, parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 1344, *R* = 13/16 LDPC matrix
      3. Finally, the first 96 parity bits are discarded (punctured) to create the output codeword 
   4. If ρ = 2 and *LCW* = 672, *R* = 1/2:
      1. The output stream of scrambler is broken into the blocks of length 168 bits such that the *m*-th data word is 
      2. To each data word, zero bits  and parity bits  are added to create the codeword  such that 
      3. Finally, the zero bits are replaced with word  repetition XORed by PN sequence that is generated from the LFSR used for MCS 1 scrambling as defined in 30.5.8.3.2. The LFSR is initialized to all ones initial seed value and reinitialized to the same seed after every codeword.
   5. If ρ = 2 and *LCW* = 1344, *R* = 1/2:
      1. The output stream of scrambler is broken into the blocks of length 336 bits such that the *m*-th data word is 
      2. To each data word, zero bits  and parity bits  are added to create the codeword  such that 
      3. Finally, the zero bits are replaced with word  repetition XORed by PN sequence that is generated from the LFSR used for MCS 1 scrambling as defined in 30.5.8.3.2. The LFSR is initialized to all ones initial seed value and reinitialized to the same seed after every codeword.
   6. If ρ = 1 and *LCW* = 504, *R* = 2/3:
      1. The output stream of scrambler is broken into the blocks of length 336 bits such that the *m*-th data word is 
      2. To each data word, zero bits  and parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 672, *R* = ¾ LDPC matrix
      3. Finally, the zero bits are discarded to create the output codeword 
   7. If ρ = 1 and *LCW* = 1008, *R* = 2/3:
      1. The output stream of scrambler is broken into the blocks of length 672 bits such that the *m*-th data word is 
      2. To each data word, zero bits  and parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 1344, *R* = ¾ LDPC matrix
      3. Finally, the zero bits are discarded to create the output codeword 
   8. If ρ = 1 and *LCW* = 504, *R* = 5/6:
      1. The output stream of scrambler is broken into the blocks of length 420 bits such that the *m*-th data word is 
      2. To each data word, zero bits  and parity bits  are added to create the codeword  such that , parity bits are computed applying for *LCW* = 672, *R* = 7/8 LDPC matrix
      3. Finally, the zero bits are discarded to create the output codeword 
   9. If ρ = 1 and *LCW* = 1008, *R* = 5/6:
      1. The output stream of scrambler is broken into the blocks of length 840 bits such that the *m*-th data word is 
      2. To each data word, zero bits  and parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 1344, *R* = 7/8 LDPC matrix
      3. Finally, the zero bits are discarded to create the output codeword 
   10. If ρ = 1 and *LCW* = 468, *R* = 5/6:
       1. The output stream of scrambler is broken into the blocks of length 390 bits such that the *m*-th data word is 
       2. To each data word, zero bits  and parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 672, *R* = 13/16 LDPC matrix
       3. Finally, the zero bits are discarded and the first 48 parity bits are discarded (punctured) to create the output codeword 
   11. If ρ = 1 and *LCW* = 936, *R* = 5/6:
       1. The output stream of scrambler is broken into the blocks of length 780 bits such that the *m*-th data word is 
       2. To each data word, zero bits  and parity bits  are added to create the codeword  such that , parity bits are computed applying *LCW* = 1344, *R* = 13/16 LDPC matrix
       3. Finally, the zero bits are discarded and the first 96 parity bits are discarded (punctured) to create the output codeword 
3. For each spatial stream concatenate LDPC codewords one after the other to create the coded bits stream .
4. Compute the number of coded pad bits per *iSS*-th spatial stream, , using the number of SC symbol blocks, :









1. Concatenate coded bits for *iSS*-th spatial stream with  zero bits. They are scrambled using the continuation of the scrambler sequence that scrambled the PSDU input bits and data pad bits at step a). The pad bits of the first spatial stream are scrambled first, the pad bits of the second spatial stream are scrambled second, and so on.

For each user, if STBC coding is applied, then a single spatial stream  is mapped to two space-time streams  as defined in 30.5.8.5.3. Otherwise, a one-to-one mapping of  spatial streams to  space-time streams shall be applied.

NOTE— is defined on a per user basis in the Requested BRP SC Blocks field within a responder’s EDMG Capabilities element. If the Requested BRP SC Blocks field is not included in the EDMG Capabilities element, then  = aBRPminSCblocks.

* + - * 1. MU PPDU padding and space-time streams mapping

For an MU PPDU transmission, all user PPDUs shall be aligned in time. If necessary to achieve this, PSDUs within the MU PPDU shall be padded according to the following steps:

1. Compute the maximum number of SC symbol blocks over all users  for iuser = 1, 2, …, Nuser.
2. Update the number of SC symbol blocks at step e) in 30.5.8.4.3 as  for iuser = 1, 2, …, Nuser. Update the number of pad bits for the iuserth user accordingly.
3. The number of pad SC symbol blocks for the MU PPDU transmission for the iuserth user is defined as .

The number of pad blocks  takes into account the MU PPDU padding only and does not include the regular padding described in 30.5.8.4.3.

The space-time stream index per user, , is mapped to the space-time stream index over all users, , as follows:



NOTE— is a function of  and  indices. However, to simplify the notation, this dependence is not indicated explicitly in other equations.

Modify the following Section:

* + - 1. Modulation mapping
         1. General

The coded and padded bit stream is converted into a stream of complex constellation points, following the rules defined in 20.6.3.2.4 for π/2-BPSK, π/2-QPSK, π/2-16-QAM, and π/2-64-QAM. For π/2-8-PSK, follow the rules defined in 30.5.8.5.2.

Add the following Section:

#### 30.5.8.5.2 π/2-8-PSK modulation

In π/2-8-PSK modulation, the input stream is grouped into sets of 3 bits and mapped according to the following equation:



where *k* is the symbol output index, *k* = 0, 1, …. Each output symbol is then rotated according to the following equation: . The constellation bit encoding for 8-PSK is depicted in Figure 1 below.





Figure 1: 8-PSK constellation bit encoding