IEEE P802.11  
Wireless LANs

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| 11bn PDT PHY UHR-SIG | | | | |
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Abstract

This document contains Proposed Draft Text (PDT) for the UHR-SIG of the TGbn (UHR, Ultra High Reliability) amendment to the 802.11 standard.

* *The following motions are incorporated: 40, 84, 52, 43, 39, 53, 111, 165, 166, 167, 168, 169, 171, 172, 173, 174, 177.*

# Revision information

The following is a summary of the important changes that occurred within each revision of this document:

|  |  |
| --- | --- |
| **Revision** | **Major changes** |
| 0 | Initial revision |
| 1 | New motions on Dec. 19th are considered |
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# Introduction

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGbn Draft. The abstract, revision information, introduction, explanation of the proposed changes, and references sections are not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbn Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

## Explanation of the proposed changes:

The proposed changes to the 802.11 TGbn draft within this document are based on the following motions adopted by the TGbn task group.

### Relevant passing motions:

#### **[Motion #40, [1]]**

* For a (non-ELR) UHR MU PPDU, there exists a 1-bit EQM/UEQM indication in a User field for non-MU-MIMO in the UHR-SIG field.

#### **[Motion #84, [1]]**

* For a (non-ELR) UHR MU PPDU, when EQM/UEQM indicates UEQM in a User field for non-MU-MIMO, there exists a MCS field, a NSS field and a 2 bit field indicating UEQM patterns.

#### **[Motion #52, [1]]**

* UEQM patterns for Nss=2 are limited to two as:
  + [M, M-1]
  + [M, M-2]

Note: M is the constellation index; M-1 refers to the constellation that is one order lower than M; M-2 refers to the constellation that is two orders lower than M.

#### **[Motion #43, [1]]**

* UEQM patterns for Nss=3 are limited to three:
  + [M, M, M-1]
  + [M, M, M-2]
  + [M, M-1, M-2]

Note: M is the constellation index; M-1 refers to the constellation that is one order lower than M; M-2 refers to the constellation that is two orders lower than M.

#### **[Motion #39, [1]]**

* For 4 SS, the UEQM patterns only include:
  + 1st ss, 2nd ss, 3rd ss, 4th ss,
  + [M, M, M, M-1]
  + [M,M,M,M-2]
  + [M,M,M-1,M-2]
  + [M,M-1,M-1,M-2]

Note: M is the constellation index; M-1 refers to the constellation that is one order lower than M; M-2 refers to the constellation that is two orders lower than M.

#### **[Motion #53, [1]]**

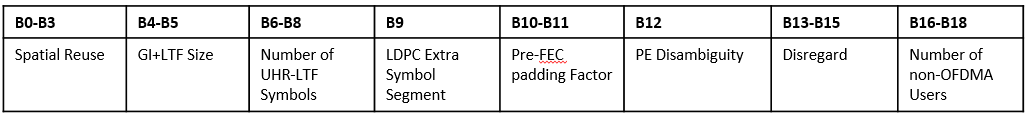
* UHR defines unequal modulation only for LDPC

#### **[Motion #111, [1]]**

* The pre-UHR portion (the portion up-to and including UHR-SIG) of the COBF PPDU shall be transmitted in a non-beamformed (omni) manner.

#### **[Motion #165, [3]]**

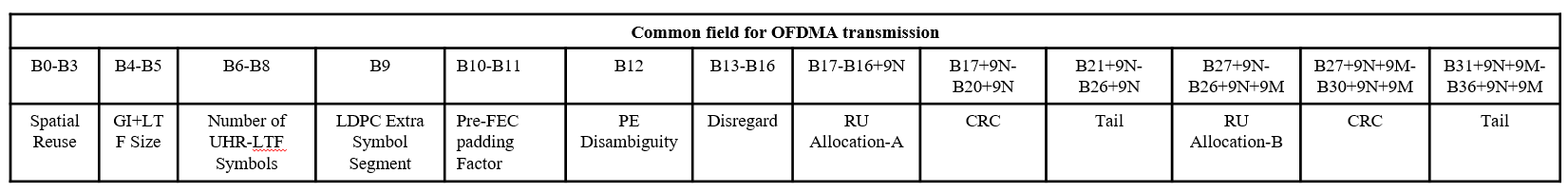
* Keep other fields except the Disregard bits in Common field for non-OFDMA transmission in UHR-SIG to be the same as that in Common field for non-OFDMA transmission in EHT-SIG as following



#### **[Motion #166, [3]]**

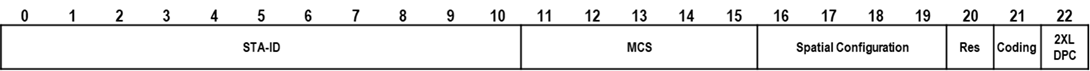
* Keep the Common field format of UHR-SIG for OFDMA transmission adheres to the Table 36-33 of 11be D7.0

Note: The entries defined for OFDMA + MU-MIMO in RU Allocation table may be updated



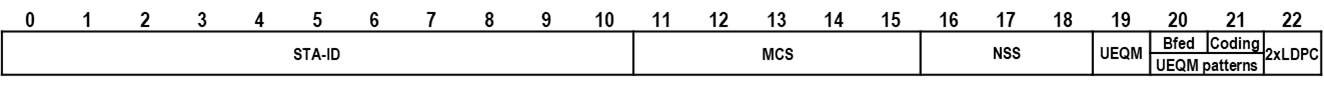
#### **[Motion #167, [3]]**

* Signaling design for MU MIMO User field in UHR-SIG field as shown in the below figure.
  + Also, when Coding field indicates LDPC, then 2xLDPC indication:
    - Bit22 set to 1: TX encode LDPC using code size as 2x1944
    - Bit22 set to 0: TX encode LDPC using code size of 648, 1296, or 1944.



#### **[Motion #168, [3]]**

* Signaling design for non-MU MIMO User field in UHR-SIG field as shown in the below figure.
  + UEQM indication
    - Bit19 set to 1: UEQM is applied, B20-21 are redefined to indicate UEQM patterns.
    - Bit19 set to 0: EQM is applied. (B20 and B21 are Bfed and Coding bits)
  + Also, when Coding field indicates LDPC, then 2xLDPC indication:
    - Bit22 set to 1: TX encode LDPC using code size as 2x1944
    - Bit22 set to 0: TX encode LDPC using code size of 648, 1296, or 1944



#### **[Motion #169, [3]]**

* The UEQM patterns indication for NSS=2, 3 and 4 are as follows:
  + NSS=2:

|  |  |  |
| --- | --- | --- |
| Index | 1st SS | 2nd SS |
| 0 | M | M-1 |
| 1 | M | M-2 |
| 2-3 | Reserved | |

* + NSS=3:

|  |  |  |  |
| --- | --- | --- | --- |
| Index | 1st SS | 2nd SS | 3rd SS |
| 0 | M | M | M-1 |
| 1 | M | M | M-2 |
| 2 | M | M-1 | M-2 |
| 3 | Reserved | | |

* + NSS=4:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | 1st SS | 2nd SS | 3rd SS | 4th SS |
| 0 | M | M | M | M-1 |
| 1 | M | M | M | M-2 |
| 2 | M | M | M-1 | M-2 |
| 3 | M | M-1 | M-1 | M-2 |

* + Note: Reserved entries will be further categorized as Validate or Disregard, following principles in IEEE 802.11be

#### **[Motion #171, [3]]**

* The Spatial Configuration field in User field of UHR-SIG field in PPDUs for COBF transmission re-uses the same design as in UHR DL MU-MIMO.
  + Encoding table will be same as 11ax

#### **[Motion #172, [3]]**

* In a PPDU of COBF transmission, all the User fields of UHR-SIG belonging to an AP and the corresponding spatial streams are contiguous.
  + The user fields of one AP are together followed by the ones of the other AP and the same holds for spatial streams

#### **[Motion #173, [3]]**

* LDPC is the only coding mode for COBF.

#### **[Motion #174, [3]]**

* Add a 1-bit 2xLDPC subfield in the UHR variant User Info field in Trigger Frame, MU-MIMO and non-MU-MIMO User field formats in UHR-SIG
* The 2xLDPC subfield is set to 1 to indicate 2xLDPC (nominal codeword size of 3888) is used, or set to 0 to indicate it’s not used, if the coding scheme is LDPC
* In the MU-MIMO or non-MU-MIMO User field formats, the 2xLDPC subfield is set to 1 and treat as Validate if Coding is BCC (0)
* In the UHR Variant User Info field in Trigger Frame, the 2xLDPC subfield is set to 1 and reserved if UL FEC Coding Type is BCC (0)

#### **[Motion #177, [3]]**

* Use B13 in the Common field of UHR-SIG in non-OFDMA to indicate Interference Mitigation (IM) ON/OFF
  + Value 0 indicates IM enabled
  + Value 1 indicates IM disabled (because B13 was originally “set to 1 and Disregard at RX’)

# Text to be adopted begins here:

***TGbn editor: Please add the following new subclauses for UHR-SIG to the 802.11bn draft D0.1 (NOTE: The following subclauses are based on 11-24-1993r0):***

# 38. Ultra High Reliability (UHR) PHY specification

## 38.3 UHR PHY

### 38.3.14 UHR preamble

#### **38.3.14.9 UHR-SIG**

##### **38.3.14.9.1 General**

##### **38.3.14.9.2 UHR-SIG Content Channels**

##### **38.3.14.9.3 Common field for OFDMA transmission**

The Common field for OFDMA transmission is defined in [Table 38-A (Common field for OFDMA](#_bookmark121) [transmission)](#_bookmark121).

###### Table 38-A—Common field for OFDMA transmission

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bit** | **Subfield** | **Number of subfields** | **Number of bits per subfield** | **Description** |
| B0–B3 | Spatial Reuse | 1 | 4 | Indicates whether or not spatial reuse modes are allowed during the transmission of this PPDU.  Set to a value from Table 27-23 (Spatial Reuse field encoding for an HE SU PPDU, HE ER PPDU, and HE MU PPDU). Note  that Table 27-23 (Spatial Reuse field encoding for an HE SU PPDU, HE ER PPDU, and HE MU PPDU) also applies to UHR MU PPDU. See (SPATIAL\_REUSE) and (UHR Spatial reuse operation). |
| B4–B5 | GI+LTF Size | 1 | 2 | Indicates the GI duration and UHR-LTF size: Set to 0 to indicate 2 LTF + 0.8 µs GI.  Set to 1 to indicate 2 LTF + 1.6 µs GI. Set to 2 to indicate 4 LTF + 0.8 µs GI. Set to 3 to indicate 4 LTF + 3.2 µs GI. |
| B6–B8 | Number Of UHR- LTF Symbols | 1 | 3 | Indicate the number of UHR-LTF symbols: Set to 0 to indicate 1 UHR-LTF symbol.  Set to 1 to indicate 2 UHR-LTF symbols. Set to 2 to indicate 4 UHR-LTF symbols. Set to 3 to indicate 6 UHR-LTF symbols. Set to 4 to indicate 8 UHR-LTF symbols. Values 5–7 are Validate. |
| B9 | LDPC Extra Symbol Segment | 1 | 1 | Indicates the presence of the LDPC extra symbol segment:  Set to 1 if an LDPC extra symbol segment is present.  Set to 0 if an LDPC extra symbol segment is not present. |
| B10–B11 | Pre-FEC Padding Factor | 1 | 2 | Indicates the pre-FEC padding factor:  Set to 0 to indicate a pre-FEC padding factor of 4.  Set to 1 to indicate a pre-FEC padding factor of 1.  Set to 2 to indicate a pre-FEC padding factor of 2.  Set to 3 to indicate a pre-FEC padding factor of 3. |
| B12 | PE Disambiguity | 1 | 1 | Indicates PE disambiguity as defined in (Packet extension). |
| B13–B16 | Disregard | 1 | 4 | Set to all 1s. |
| B17–  B16+9*N* | RU Allocation-A | *N* | 9 | *N* RU Allocation-A subfields are present in a UHR-SIG content channel, where:  *N* is set to 1 if the Bandwidth field in the U- SIG field is equal to 0 or 1.  *N* is set to 2 if the Bandwidth field in the U- SIG field is equal to 2, 3, 4, or 5.  Each RU Allocation-A subfield in a UHR- SIG content channel corresponding to a 20 MHz frequency subchannel indicates the RU or MRU assignment, including the size of the RU(s) or MRU(s) and their placement in the frequency domain, to be used in the UHR modulated fields of the UHR MU PPDU in the frequency domain, where the subcarrier indices of the RU(s) or MRU(s) meet the conditions in Table 36-35 (RUs or MRUs associated with each RU Allocation subfield for each EHT-SIG content channel and PPDU bandwidth). Each RU Allocation-A subfield also indicates information needed to compute the number of users allocated to each of these RU(s) or MRU(s). |
| B17+9*N*-  B20+9*N* | CRC | 1 | 4 | The CRC is calculated over bits 0 to 16+9*N*. The CRC computation uses the same polynomial as that in 27.3.11.7.3 (CRC computation). |
| B21+9*N* –  B26+9*N* | Tail | 1 | 6 | Used to terminate the trellis of the convolutional decoder. Set to 0. |
| B27+9*N* –  B26+9*N*+9*M* | RU Allocation-B | *M* | 9 | *M* RU Allocation-B subfields are present in a UHR-SIG content channel if the Bandwidth subfield in the U-SIG field ~~indicates a 160 MHz, 320 MHz-1, or 320 MHz-2~~ is equal to 3, 4, or 5 in a UHR MU PPDU where *M* is equal to 2 or 6 as follows:  *M* is set to 2 if the Bandwidth field in the U- SIG field is 3.  *M* is set to 6 if the Bandwidth field in the U- SIG field is 4 or 5.  The subfields are not present otherwise (i.e.,  *M* is equal to 0).  Each RU Allocation-B subfield in a UHR- SIG content channel corresponding to a 20 MHz frequency subchannel indicates the RU or MRU assignment, including the size of the RU(s) or MRU(s) and their placement in the frequency domain, to be used in the UHR modulated fields of the UHR MU PPDU in the frequency domain, where the subcarrier indices of the RU(s) or MRU(s) meet the conditions in Table 36-35 (RUs or MRUs associated with each RU Allocation subfield for each EHT-SIG content channel and PPDU bandwidth). Each RU Allocation-B subfield also indicates information needed to compute the number of users allocated to each of these RU(s) or MRU(s). |
| B27+9*N*+9*M* – B30+9*N*+9*M* | CRC | 0 or 1 | 4 | The CRC subfield is present if the Bandwidth subfield in the U-SIG field indicates a 160 MHz, 320 MHz-1, or 320 MHz-2 UHR MU PPDU and not present otherwise.  If present, the CRC is calculated over bits 27+9*N* to 26+9*N*+9*M*. The CRC computation uses the same polynomial as that in 27.3.11.7.3 (CRC computation).  NOTE—*N*=2 when the CRC subfield exists. |
| B31+9*N*+9*M* – B36+9*N*+9*M* | Tail | 0 or 1 | 6 | The Tail subfield is present if the Bandwidth subfield in the U-SIG field indicates a 160 MHz, 320 MHz-1, or 320 MHz-2 UHR MU PPDU and not present otherwise.  If present, then it is used to terminate the trellis of the convolutional decoder. Set to 0.  NOTE—*N*=2 when the Tail subfield exists. |

B0–B16 of [Table 38-A (Common field for OFDMA transmission)](#_bookmark121) are U-SIG Overflow bits for OFDMA transmission and are duplicated in each content channel.

Both RU Allocation-A subfield and RU Allocation-B subfield refer to an RU Allocation subfield, located in different common encoding blocks

Note: The entries defined for OFDMA + MU-MIMO in the RU Allocation subfield table may be updated.

##### **38.3.14.9.4 Common field for non-OFDMA transmission**

The Common field for a UHR SU transmission and non-OFDMA transmission to multiple users is defined in [Table 38-B (Common field for a UHR SU transmission and non-OFDMA transmission to multiple](#_bookmark125) [users)](#_bookmark125).

###### Table 38-B—Common field for a UHR SU transmission and non-OFDMA transmission to multiple users

|  |  |  |  |
| --- | --- | --- | --- |
| **Bit** | **Subfield** | **Number of bits** | **Description** |
| B0–B3 | Spatial Reuse | 4 | Indicates whether or not spatial reuse modes are allowed during the transmission of this PPDU.  Set to a value from Table 27-23 (Spatial Reuse field encoding for an HE SU PPDU, HE ER PPDU, and HE MU PPDU). Note that  Table 27-23 (Spatial Reuse field encoding for an HE SU PPDU, HE ER PPDU, and HE MU  PPDU) also applies to UHR MU PPDU. See (SPATIAL\_REUSE) and (UHR Spatial reuse operation). |
| B4–B5 | GI+LTF Size | 2 | Indicates the GI duration and UHR-LTF size: Set to 0 to indicate 2 LTF + 0.8 µs GI.  Set to 1 to indicate 2 LTF + 1.6 µs GI. Set to 2 to indicate 4 LTF + 0.8 µs GI. Set to 3 to indicate 4 LTF + 3.2 µs GI. |
| B6–B8 | Number Of UHR-LTF Symbols | 3 | Indicate the number of UHR-LTF symbols: Set to 0 to indicate 1 UHR-LTF symbol.  Set to 1 to indicate 2 UHR-LTF symbols. Set to 2 to indicate 4 UHR-LTF symbols. Set to 3 to indicate 6 UHR-LTF symbols. Set to 4 to indicate 8 UHR-LTF symbols. Values 5–7 are Validate. |
| B9 | LDPC Extra Symbol Segment | 1 | Indicates the presence of the LDPC extra symbol segment:  Set to 1 if an LDPC extra symbol segment is present.  Set to 0 if an LDPC extra symbol segment is not present. |
| B10–B11 | Pre-FEC Padding Factor | 2 | Indicates the pre-FEC padding factor:  Set to 0 to indicate a pre-FEC padding factor of 4.  Set to 1 to indicate a pre-FEC padding factor of 1.  Set to 2 to indicate a pre-FEC padding factor of 2.  Set to 3 to indicate a pre-FEC padding factor of 3. |
| B12 | PE Disambiguity | 1 | Indicates PE disambiguity as defined in [(Packet extension)](#_bookmark252). |
| B13 | Interference mitigation (IM) | 1 | Indicates whether IM is enabled or not in the Data field.  A value of 0 indicates the PPDU is sent with IM enabled.  A value of 1 indicates the PPDU is sent with IM disabled. |
| B14–B15 | Disregard | 2 | Set to all 1s. |
| B16–B18 | Number Of Non-OFDMA Users | 3 | Indicates the total number of non-OFDMA users. Set to *n* to indicate *n*+1 non-OFDMA users.  For a non-OFDMA transmission to a single user, set to 0 to indicate a UHR SU transmission.  For a non-OFDMA transmission to multiple users, set to a value larger than 0 to indicate more than one non-OFDMA users for non- OFDMA transmission to multiple users. |

B0–B15 of [Table 38-B (Common field for a UHR SU transmission and non-OFDMA transmission to](#_bookmark125) [multiple users)](#_bookmark125) are U-SIG Overflow bits for a UHR SU transmission and non-OFDMA transmission to multiple users. Both the U-SIG Overflow bits and Number Of Non-OFDMA Users subfields are duplicated in each content channel.

For a UHR SU transmission using BCC, the LDPC Extra Symbol Segment field is set to 0 to indicate that an LDPC extra symbol segment is not present.

##### **38.3.14.9.5 Common field for Co-BF transmission**

##### **38.3.14.9.6 User specific field**

The content of the common encoding block in the UHR-SIG field for a UHR SU transmission and non-OFDMA transmission to multiple users is defined in Table 36-C (The common encoding block in a UHR-SIG field for a UHR SU transmission and a non-OFDMA transmission to multiple users).

###### Table 38-C—The common encoding block in a UHR-SIG field for a UHR SU transmission and a non-OFDMA transmission to multiple users

|  |  |  |  |
| --- | --- | --- | --- |
| **Bit** | **Subfield** | **Number of bits** | **Description** |
| B0–B18 | Common field for a UHR SU transmission and non-OFDMA transmission to multiple users | 19 | The Common field for a UHR SU transmission and non-OFDMA transmission to multiple users is defined in Table 38-B (Common field for a UHR SU transmission and non-OFDMA transmission to multiple users). |
| B19–B41 | User field | 23 | The User field format for a non-MU-MIMO allocation is defined in Table 38-E (User field format for a non-MU-MIMO allocation). The User field format for an MU-MIMO allocation is defined in Table 38-G (User field format for an MU-MIMO allocation). |
| B42–B45 | CRC | 4 | The CRC is calculated over bits 0 to 41. The CRC computation uses the same polynomial as that in 27.3.11.7.3 (CRC computation). |
| B46–B51 | Tail | 6 | Used to terminate the trellis of the convolutional decoder. Set to 0 |

The user encoding block is defined in Table 36-D (The user encoding block). For non-OFDMA transmission to multiple users, the user encoding block is present if there are more than one User fields in the corresponding content channel.

###### Table 38-D —The user encoding block

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bit** | **Subfield** | **Number of subfields** | **Number of bits** | **Description** |
| B0– B23*N*-1 | User field | *N* | 23 | *N* User fields are present, where:  *N* = 1 if it is the final user encoding block, and if there is only one user in the final user encoding block.  *N* = 2 otherwise.  The User field format for a non-MU-MIMO allocation is defined in Table 38-E (User field format for a non-MU-MIMO allocation). The User field format for an MU-MIMO allocation is defined in Table 38-G (User field format for an MU-MIMO allocation). |
| B23*N*– B23*N*+3 | CRC | 1 | 4 | The CRC is calculated over bits 0 to 22 for a user encoding block that contains one User field, and bits 0 to 45 for a user encoding block that contains two User fields. The CRC computation uses the same polynomial as that in 27.3.11.7.3 (CRC computation). |
| B23*N*+4– B23*N*+9 | Tail | 1 | 6 | Used to terminate the trellis of the convolutional decoder. Set to 0. |

The User field format for a non-MU-MIMO allocation is defined in Table 38-E (User field format for a non-MU-MIMO allocation).

###### Table 38-E—User field format for a non-MU-MIMO allocation

|  |  |  |  |
| --- | --- | --- | --- |
| **Bit** | **Subfield** | **Number of bits** | **Description** |
| B0–B10 | STA-ID | 11 | Set to a value of the TXVECTOR parameter STA-ID (see (STA-ID)). |
| B11–B15 | MCS | 5 | If the STA-ID subfield is not equal to 2046, this subfield indicates the following modulation and coding scheme:  Set to *n* for UHR-MCS *n*, where *n* = 0, 1, …, 15, x1, x2, x3 and x4. Other values are Validate.  Set to an arbitrary value if the STA-ID subfield is equal to 2046.  If the UL/DL subfield of the U-SIG field is set to 0:   * If the value of STA-ID subfield matches the user’s STA-ID, the value of UHR-MCS 14 or UHR-MCS 15 is Validate if the condition described in 38.1.1 (Introduction to the UHR [PHY)](#_bookmark1) is not met. * If the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard.   If the UL/DL subfield of the U-SIG field is set to 1, the value of UHR-MCS 14 or UHR-MCS 15 is Validate if the condition described in 38.1.1 (Introduction to the UHR [PHY)](#_bookmark1) is not met. |
| B16–B18 | NSS | 3 | If the STA-ID subfield is not equal to 2046, it indicates the number of spatial streams for up to eight spatial streams.  Set to the number of spatial streams minus 1.  Set to an arbitrary value if the STA-ID subfield is equal to 2046.  If the UL/DL subfield of the U-SIG field is set to 0:  — If the value of STA-ID subfield matches the user’s STA-ID and if the UEQM subfield is set to 1, values other than 1-3 are Validate.  — If the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard. |
| B19 | UEQM | 1 | If the STA-ID subfield is not equal to 2046, it indicates whether EQM or UEQM is used:  Set to 0 for EQM.  Set to 1 for UEQM.  Set to an arbitrary value if the STA-ID subfield is equal to 2046.  If the UL/DL subfield of the U-SIG field is set to 0 and if the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard. |
| B20-B21 | Beamformed And Coding / UEQM Pattern | 2 | If the STA-ID subfield is not equal to 2046, and the UEQM subfield is equal to 0:  B20 is the Beamformed subfield indicating transmit beamforming:  Set to 1 if a beamforming steering matrix is applied to the waveform in a non-MU-MIMO allocation.  Set to 0 otherwise.  B21 is the Coding subfield indicating whether BCC or LDPC is used:  Set to 0 for BCC.  Set to 1 for LDPC.  If the UL/DL subfield of the U-SIG field is set to 0 and if the value of STA-ID subfield does not match the user’s STA-ID, all values of B20 and B21 are Disregard.  If the STA-ID subfield is not equal to 2046, and the UEQM subfield is equal to 1:  LDPC is used and B20-B21 is the UEQM Pattern subfield indicating the UEQM pattern for the corresponding number of spatial streams indicated in the NSS subfield. See Table 38-F (UEQM Pattern Subfield Encoding) for definition. Undefined values of this field are Validate or Disregard.  Set to an arbitrary value if the STA-ID subfield is 2046.  If the UL/DL subfield of the U-SIG field is set to 0 and if the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard. |
| B22 | 2xLDPC | 1 | If the STA-ID subfield is not equal to 2046, and either both the UEQM subfield is equal to 0 and the Coding subfield is equal to 1 or the UEQM subfield is equal to 1, this subfield indicates whether nominal LDPC codeword length of 3888 is used:  Set to 0 to indicate the nominal LDPC codeword length of 648, 1296 or 1944 is used.  Set to 1 to indicate the nominal LDPC codeword length of 3888 is used.  If the STA-ID subfield is not equal to 2046, the UEQM subfield is equal to 0 and the Coding subfield is equal to 0, this subfield is set to 1 and treat as Validate.  Set to an arbitrary value if the STA-ID subfield is 2046.  If the UL/DL subfield of the U-SIG field is set to 0 and if the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard. |

In Table 38-F (UEQM pattern subfield encoding), “s” is the constellation index value corresponding to the modulation order of the UHR-MCS used in the first spatial stream, which is defined in Table 9-417u (Constellation index), and “s-∆” represents the modulation order(s) used in the rest of the spatial stream that is ∆ modulation levels lower than s.

NOTE – The modulation order from the first to the sixth corresponds to QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, and 4096-QAM.

###### Table 38-F—UEQM pattern subfield encoding

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NSS Subfield | Number of Spatial Streams | UEQM Pattern Subfield | UEQM pattern | | | |
| Stream 1 | Stream 2 | Stream 3 | Stream 4 |
| 1 | 2 | 0 | s | s-1 | N/A | N/A |
| 1 | s | s-2 | N/A | N/A |
| 2 | 3 | 0 | s | s | s-1 | N/A |
| 1 | s | s | s-2 | N/A |
| 2 | s | s-1 | s-2 | N/A |
| 3 | 4 | 0 | s | s | s | s-1 |
| 1 | s | s | s | s-2 |
| 2 | s | s | s-1 | s-2 |
| 3 | s | s-1 | s-1 | s-2 |

The User field format for an MU-MIMO allocation is defined in Table 38-G (User field format for an MU-MIMO allocation).

###### Table 38-G—User field format for an MU-MIMO allocation

|  |  |  |  |
| --- | --- | --- | --- |
| **Bit** | **Subfield** | **Number of bits** | **Description** |
| B0-B10 | STA-ID | 11 | Set to a value of the TXVECTOR parameter STA-ID (see (STA\_ID)).  NOTE—An RU/MRU using MU-MIMO has RU/ MRU size greater than or equal to 242 tones. Thus, the STA ID subfield is not set to 2046 for an MU-MIMO RU allocation (see 38.3.14.9.3 (Common field for OFDMA transmission)). |
| B11-B15 | MCS | 5 | Indicates the following modulation and coding scheme:  Set to n for UHR-MCS n, where n = 0,1,…,13, x1, x2, x3 and x4.    If the value of STA-ID subfield matches the user’s STA-ID, other values are Validate. If the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard. |
| B16-B19 | Spatial Configuration | 4 | Indicates the number of spatial streams for a user in an MU-MIMO allocation (see Table 27-31 (Spatial Configuration subfield encoding(11ax))).  If STA-ID matches, the values that are reserved or do not exist in Table 27-31 (Spatial Configuration subfield encoding(11ax)) are Validate. If STA-ID does not match, all values are Disregard. |
| B20 | Disregard | 1 | Set to 1. |
| B21 | Coding | 1 | It indicates whether BCC or LDPC is used:  Set to 0 for BCC.  Set to 1 for LDPC.  If the RU size is larger than 242, this bit is reserved and set to 1.  If the value of STA-ID subfield matches the user’s STA-ID, the Reserved subfield is Validate. If the value of STA-ID subfield does not match the user’s STA-ID, the Reserved subfield is Disregard. |
| B22 | 2xLDPC | 1 | If the Coding subfield is equal to 1, it indicates whether nominal LDPC codeword with length of 3888 is used or not:  Set to 0 to indicate the nominal LDPC codeword with length of 648, 1296 or 1944 is used.  Set to 1 to indicate the nominal LDPC codeword with length of 3888 is used.  Otherwise, this subfield is set to 1 and treat as Validate.  If the UL/DL subfield of the U-SIG field is set to 0 and if the value of STA-ID subfield does not match the user’s STA-ID, all values are Disregard. |

The Spatial Configuration field in User field of UHR-SIG field in PPDUs for Co-BF transmission re-uses the same design as in UHR DL MU-MIMO. The encoding table will be the same as that in EHT.

In a PPDU of Co-BF transmission, all the User fields of UHR-SIG belonging to an AP and the corresponding spatial streams are contiguous. The user fields of one AP are together followed by the ones of the other AP and the same holds for spatial streams

LDPC is the only coding mode for Co-BF.

##### **38.3.14.9.7 Encoding and modulation**

The UHR-SIG of a Co-BF PPDU shall be transmitted in a non-beamformed (omni) manner.

# Text to be adopted ends here.

# References:

1. 11-24-0171-21-00bn-tgbn-motions-list-part-1, Alfred Asterjadhi (Qualcomm Inc.)
2. 11-24-1993-00-00bn-tgbn-d0-1-spec-skeleton, Ross Jian Yu (Huawei)
3. 11-24-0171-26-00bn-tgbn-motions-list-part-1, Alfred Asterjadhi (Qualcomm Inc.)