IEEE P802.11
Wireless LANs

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| --- |
| Multi-Static PPDU Sync field |
| Date: 2022-07-09 |
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|  |  |  |  |  |

Abstract

This document presents resolution to CID 417.

**Discussion**

This document proposes resolution to CID 417

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 417 | 28 | 89.01 | No description of DMG multi-static instance PPDU | submission will be provided |

***TGbf Editor: Add the following subclause:***

**8.3.4.4 Vector descriptions**

***Editor: Add the following lines at the end table 8-4 Vector descriptions***

|  |  |  |
| --- | --- | --- |
| Parameters | Associated Vector | Value |
| EDMG\_MS\_SENSING\_STA | PHYCONFIG\_VECTOR | Sets to a non zero value *r* between 1 and 8 to indicate that the next PPDU to be received is an EDMG Multi-Static Sensing PPDU and that this STA is assigned the (*r-1)*’th multi-static ID.Set to 0 if the next PPDU is not expected to be an EDMG Multi-Static Sensing PPDU. |
| EDMG\_MS\_SENSING\_NSTA | PHYCONFIG\_VECTOR | Set to the number of STAs participating in the next EDMG Multi-Static Sensing PPDU |

***TGbf Editor: Modify Figure 9-110a (D0.1) as follows:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 B7 | B8 B15 | B16 B23 | B24 B26 | B27 B34 |
|  | Measurement Setup Id | Measurement Burst Id | Sensing Instance Number | STA Id | First Beam Index |
| bits: | 8 | 8 | 8 | 3 | 8 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B35 B37 | B38 B39 | B40 B47 | B48 B55 |
|  | Num of STAs in Instance | Num of PPDU in Instance | EDMG TRN Length | RX TRN-Units per Each TXTRN-Unit |
| bits: | 3 | 2 | 8 | 8 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B56 B57 | B58 B61 | B62 B63 | B64 | B65 B72 | B73 B79 |
|  | EDMG TRN-Unit P | EDMG TRN-Unit M | EDMG TRN-Unit N | TRN Subfield Sequence Length | BW | Reserved |
| bits: | 2 | 4 | 2 | 1 | 8 | 7 |

***TGbf Editor: Change the text in P29L62-65 as follows:***

The EDMG TRN Length, RX TRN-Units per Each TX TRN-Unit, EDMG TRN-Unit P, EDMG TRN-Unit M, EDMG TRN-Unit N, TRN Subfield Sequence Length and BW subfields contain the values of the corresponding header fields in the EDMG Multi-static Sensing PPDU.

***TGbf Editor: Insert new subclause:***

**28.2.2 TXVECTOR and RXVECTOR parameters**

***Editor: Insert the following lines in Table 28-1***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Condition** | **Value** | **TXVECTOR** | **RXVECTOR** |
| EDMG\_MS\_SENSING | FORMAT is EDMG, EDMG\_MODULATION is EDMG\_SC\_MODE, NUM\_USERS is 1, NUM\_STS is 1  | Set to 1 to Indicates that the PPDU is an EDMG Multi-Static Sensing PPDUSet to 0 otherwise | Y | Y |
| Otherwise | Not Present |  |  |
| EDMG\_MS\_SENSING\_NSTA | EDMG\_MS\_SENSING is present and set to 1 | Set to the number of Sync subfields in this EDMG Multi-Static Sensing PPDU. | Y | Y |
| Otherwise | Not Present |  |  |

***TGbf Editor: Insert new subclause:***

**28.3.3.3.2.3 Definition for EDMG SC mode and EDMG OFDM mode PPDUs**

***Editor: Replace the last line of Table 28-13—EDMG-MCS field definition when the Number of SS field is 0 with the following 3 lines:***

|  |  |  |  |
| --- | --- | --- | --- |
| Multi-Static Sensing | 1 | 9 | Corresponds to TXVECTOR parameter MG\_MS\_SENSING. Set to 1 to Indicates that the PPDU is an EDMG Multi-Static Sensing PPDU. Set to 0 otherwise |
| Multi-Static Sensing NSTA | 3 | 10 | Corresponds to TXVECTOR parameter EDMG\_MS\_SENSING\_NSTA. Set to the number of Sync subfields in this EDMG Multi-Static Sensing PPDU. |
| Reserved | 8 | 13 |  |

***TGbf Editor: Insert the following new clause 28.9.4***

***Editor: Insert the following subclause at the end of 29.9.3***

### 28.9.4 EDMG Multi-Static Sensing PPDU

### 28.9.4.1 General

EDMG Multi-Static Sensing PPDUs are used for multi-static sensing. EDMG Multi-Static Sensing is defined for single space-time stream ($i\_{STS}=1$) SC PPDUs only.

### 28.9.4.2 EDMG Multi-Static Sensing PPDU structure

The structure of an EDMG Multi-Static Sensing PPDU is TBD. An EDMG Multi-Static Sensing PPDU enables sensing by $N\_{STA}$ STAs, using the same PPDU, where $N\_{STA}$ is value of the Multi-Static Sensing NSTA field in the EDMG-A header. If sensing is performed on a 4.32 GHz, 6.48 GHz, or 8.64 GHz channel, the Sync field and the TRN field in the EDMG Multi-Static Sensing PPDUs shall occupy 2, 3, or 4 contiguous 2.16 GHz channels, respectively. See Figure 1.

Note: A STA that is participating in an EDMG Multi-static Sensing Instance as a receiver may ignore all the PPDU fields preceding the Sync field use its intended Sync Subfield for synchronization.

### 28.9.4.3 EDMG Multi-Static Sensing PPDU header fields

An EDMG Multi-Static sensing PPDU is indicated by setting the Multi-Static Sensing field of the EDMG-A header to 1. The number of Sync fields in the PPDU is indicated by the Multi-Static Sensing NSTA field of the EDMG-A header.

The setting of the PSDU Length field is TBD.

The fields RX TRN-Units per Each TX TRN-Unit, the EDMG TRN-Unit P, EDMG TRN-Unit M and EDMG TRN-Unit N are used in the same way as in an EDMG BRP frame (see 28.9.2.2.3). However, $N\_{STA}P$ subfields are of the EDMG TRN-Unit M are used in a different way, as defined in 28.9.4.5, where $N\_{STA}, P$ have the values in the Multi-Static Sensing NSTA and EDMG TRN-Unit P fields in the header respectively.

The EDMG TRN Length field is used the indicate the length of the training fields. The value in the EDMG TRN Length is set to the value used to describe the TRN field (number of TRN units).

The Beam Tracking Request field and the EDMG Beam Tracking Request field shall be set to 0 in an EDMG Multi-Static sensing PPDU.

### 28.9.4.4 EDMG Multi-Static Sensing PPDU Sync Field

### 28.9.4.4.1 General

The EDMG Multi-Static Sensing PPDU Sync Field is composed of $N\_{Sync}$ Sync subfields followed by a Sync pad subfield.

### 28.9.4.4.2 Sync Subfield definition



Figure 2 - Sync Subfield structure

Each Sync subfield is composed of 18 Golay Sequences. The Sync subfields for different STAs use different rows from the matrix $M(r,c)$ defined in Table 1. $r$ is the STA ID

$$r\_{SYNC}\left(q\frac{T\_{c}}{N\_{CB}}\right)=\begin{matrix}\sum\_{k=0}^{7}-M\left(r,7\right)∙Gj\_{TRN\\_BL×N\_{CB}}^{p}\left(q-k∙TRN\\_BL×N\_{CB}\right) +M(r,7)∙Gj\_{TRN\\_BL×N\_{CB}}^{p}\left(q-8∙TRN\\_BL×N\_{CB}\right)+\\\sum\_{k=0}^{3}M(r,2k)∙Gi\_{TRN\\_BL×N\_{CB}}^{p}\left(q-\left(2k+9\right)∙TRN\\_BL×N\_{CB}\right)+\sum\_{k=0}^{3}M(r,2k+1)∙Gj\_{TRN\\_BL×N\_{CB}}^{p}\left(q-(2k+10)∙TRN\\_BL×N\_{CB}\right)\\+M(r,0)∙Gi\_{TRN\\_BL×N\_{CB}}^{p}\left(q-17∙TRN\\_BL×N\_{CB}\right)\end{matrix}$$

Where $TRN\\_BL, N\_{CB}$ are defined in 28.9.2.2.

For r=1,3,5,7 p is set to 7 and for r=2,4,6 p is set to 8. For r=1,2,3,4, $G\_{j}=G\_{b}$ and $G\_{i}=G\_{a}$, for r=5,6,7,8, $G\_{j}=G\_{a}$ and $G\_{i}=G\_{b}$. The pairs of Golay complementary sequences $\left(Ga\_{128}^{p},Gb\_{128}^{p}\right), \left(Ga\_{256}^{p},Gb\_{256}^{p}\right), \left(Ga\_{384}^{p},Gb\_{384}^{p}\right), $ $\left(Ga\_{512}^{p},Gb\_{512}^{p}\right), \left(Ga\_{768}^{p},Gb\_{768}^{p}\right) $ and $\left(Ga\_{1024}^{p},Gb\_{1024}^{p}\right) $are defined in 28.10.

The matrix $M(r,c)$ is defined in Table 1.

Table 1 - Coefficient Matrix for EDMG Multi-Static Sensing Sync field

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| M(:,0) | M(:,1) | M(:,2) | M(:,3) | M(:,4) | M(:,5) | M(:,6) | M(:,7) |
| 1 | -1 | 1 | -1 | 1 | 1 | 1 | 1 |
| 1 | -1 | 1 | -1 | 1 | 1 | 1 | 1 |
| 1 | 1 | -1 | -1 | 1 | -1 | -1 | 1 |
| 1 | 1 | -1 | -1 | 1 | -1 | -1 | 1 |
| -1 | 1 | -1 | 1 | 1 | 1 | 1 | 1 |
| -1 | 1 | -1 | 1 | 1 | 1 | 1 | 1 |
| 1 | -1 | -1 | 1 | -1 | -1 | 1 | 1 |
| 1 | -1 | -1 | 1 | -1 | -1 | 1 | 1 |

The k’th Sync subfield is transmitted using an AWV optimized for reception by the k’th STA.

### 28.9.4.4.2 Sync Pad definition

The Sync pad subfield is TBD

### 28.9.4.5 TRN field for EDMG Multi-Static Sensing PPDU

The TRN field of an EDMG Multi-Static Sensing PPDU is identical to the TRN field of an EDMG BRP-TX or BRP-RX/TX PPDU as defined in 28.9.2.2.5 with the exception that instead of P TRN subfields transmitted with the AWV used to transmit the data field of the PPDU, we have $(N\_{STA}+1)P$ TRN subfields in which the k’th set of P TRN subfields are transmitted with an AWV used to transmit a the k’th Sync field, except for the first P TRN subfields which are transmitted using the AWV used to transmit the data part of the PPDU. $M-N\_{STA}P$ TRN subfields are transmitted using AWV selected by transmitter to represent its Tx beams.

**References:**

**[1] Draft P802.11bf\_D0.1**

**[2] Draft P802.11REVme\_D1.0**