IEEE P802.11
Wireless LANs

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| PDT EDMG Multi-Static PPDU structure |
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|  |  |  |  |  |

Abstract

This document presents draft text for EDMG Multi-Static PPDU structure.

**Discussion**

This document proposes draft text for EDMG Multi-Static PPDU structure. It is based on the following text from the SFD:

A multi-static EDMG sensing PPDU is an EDMG BRP-RX, BRP-TX, BRP-RX/TX PPDU with an addition of sync fields between the data and the TRN field (Motion 59, 21/1865r1).

***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, which is 1 less than the number of STAs to which the PPDU is directed. | 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

An EDMG Multi-Static Sensing PPDU is an EDMG BRP PPDU in which a Sync field is inserted between the data field of the PPDU and the TRN field. An EDMG Multi-Static Sensing PPDU enables sensing by $N\_{STA}+1$ 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.



Figure 1 - EDMG Multi-Static Sensing PPDU

### 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 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 and sync fields. The value in the EDMG TRN Length is set to the value used to describe the TRN field (number of TRN units) and an additional value equal to the minimum number of TRN units that will be longer than the combined Sync fields.

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 $N\_{Sync}-1$ 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 13 Golay Sequences. The Sync subfields for different STAs use different rows from the matrix $M(r,c)$ defined in Table 1.

$$r\_{SYNC}\left(q\frac{T\_{c}}{N\_{CB}}\right)=\begin{matrix}\sum\_{k=0}^{2}-M\left(r,3\right)∙Gb\_{TRN\\_BL×N\_{CB}}^{1}\left(q-k∙TRN\\_BL×N\_{CB}\right) +M(r,3)∙Gb\_{TRN\\_BL×N\_{CB}}^{1}\left(q-3∙TRN\\_BL×N\_{CB}\right)+\\\sum\_{k=0}^{3}M(r,2k)∙Ga\_{TRN\\_BL×N\_{CB}}^{1}\left(q-\left(2k+4\right)∙TRN\\_BL×N\_{CB}\right)+\sum\_{k=0}^{3}M(r,2k+1)∙Gb\_{TRN\\_BL×N\_{CB}}^{1}\left(q-(2k+5)∙TRN\\_BL×N\_{CB}\right)\\+M\left(r,0\right)∙Ga\_{TRN\\_BL×N\_{CB}}^{1}\left(q-12∙TRN\\_BL×N\_{CB}\right)\end{matrix}$$

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

The pairs of Golay complementary sequences $\left(Ga\_{128}^{1},Gb\_{128}^{1}\right), \left(Ga\_{256}^{1},Gb\_{256}^{1}\right), \left(Ga\_{384}^{1},Gb\_{384}^{1}\right), $

$\left(Ga\_{512}^{1},Gb\_{512}^{1}\right), \left(Ga\_{768}^{1},Gb\_{768}^{1}\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+1)’th STA.

### 28.9.4.4.2 Sync Pad definition

The Sync pad subfield is composed of $N\_{pad} $ $Ga\_{TRN\\_BL×N\_{CB}}^{1}$ sequences where $N\_{pad}+N\_{STA}∙L\_{SYNC}$ is the minimum integer that is an integer multiple of 6(P+M), where $N\_{STA}, P,M$ are the values in the Multi-Static Sensing NSTA, EDMG TRN-Unit P, EDMG TRN-Unit M header fields respectively and $L\_{SYNC}$ is the length of a Sync subfield.

### 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:**