IEEE P802.11
Wireless LANs

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| PDT EDMG Multi-Static PPDU structure |
| Date: 2022-03-09 |
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|  |  |  |  |  |

Abstract

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

Rev 3 : remove data, EDMG-STF and EDMG-CEF from PPDU structure, lengthen Sync Field detection field, set BW in DMG Multistatic Sensing Request

Rev 4 : Correction to the sync field definition.

Rev 5: Changes to treat EDMG Multi-Static PPDU is a new PPDU type and not only as change in TRN field, addition of PLME, error correction.

**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: 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*’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 Multi-Static 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 Multistatic 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 new subclause:***

**28.5.5 EDMG-CEF definition**

**28.5.5.1 General**

***Editor: Insert the following text at the end of subclause 28.5.5.1***

In a PPDU in which the TXVECTOR parameter EDMG\_MS\_SENSING is set to 1, the CEF is not transmitted and the length of the EDMG-CEF field is 0.

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

**28.5.9.5.2 Transmission in EDMG format**

***Editor: Insert the following text at the end of subclause 28.5.9.5.2 (Transmission in EDMG format)***

In a PPDU in which the the TXVECTOR parameter EDMG\_MS\_SENSING is set to 1, is set to 0 and the length of the data field is 0 chips.

***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 () 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 EDMG-STF (if present) or the EMDG-A Header in the place of the EDMG-CEF and data field of the PPDU. An EDMG Multi-Static Sensing PPDU enables sensing by STAs, using the same PPDU, where 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

Note: A STA that is participating in an EDMG Multistatic Sensing Instance as a receiver may ignore the L-STF, L-CEF, L-Header and EDMG-Header and 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 PSDU Length field and the EDMG MCS field shall be set to values such that the data field length , as interpreted from the EDMG-A header of the PPDU to equal to the length of the Sync field minus the length of an EDMG-CEF, if sensing is performed on a 4.32 GHz, 6.48 GHz, or 8.64 GHz channel.

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, subfields are of the EDMG TRN-Unit M are used in a different way, as defined in 28.9.4.5, where 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).

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 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 defined in Table 1. is the STA Multistatic ID

Where 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, and , for r=5,6,7,8, and . The pairs of Golay complementary sequences and are defined in 28.10.

The matrix 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 composed of sequences, such that is the minimum integer that is an integer multiple of 4, where is the length of a Sync subfield (18 Golay Sequences) and is the length of the EDMG-CEF (9 or 0 Golay Sequences, depending on whether the EDMG-CEF should be present), so that the sync field is equal in length to the EDMG-STF and EDMG-CEF when they exist and to an integer length of SC blocks.

### 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 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. TRN subfields are transmitted using AWV selected by transmitter to represent its Tx beams.

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

**28.12.3.3 TXTIME calculation for EDMG SC mode**

***Editor: Insert the following text after the paragraph:***  *μs.*

If EDMG\_MS\_SENSING is set to 1, when is the value of EDMG\_MS\_SENSING\_NSTA and and is defined in 28.9.4.4.2 Sync Pad definition.

**References:**

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

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