IEEE P802.11
Wireless LANs

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| Proposed Comment Resolution for CID 429: 30.8 EDMG Receive Procedure |
| Date: 2017-08-21 |
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Abstract

This document proposes specification text for subclause 30.8 of the spec describing EDMG receive procedure, [1], [2]. It is related to CID 429.

CID 429 comment:

Need definition of 30.8 EDMG receive procedure. Currently blank.

Proposed change:

Define and update text.

**30.8 EDMG receive procedure**

This clause defines the PHY receive procedure for EDMG format. The receive procedure for non-EDMG duplicate format is defined in clause 20.9.

Figure 1 shows PHY receive procedure for EDMG\_C\_MODE mode with schematic diagram of primitives exchange between the MAC and PHY layers through PHY SAP interface. Figure 2 shows PHY receive procedure for SU PPDU format for EDMG\_SC\_MODE or EDMG\_OFDM\_MODE. The fields of the PPDU highlighted by dotted line may not be present for some particular parameters configuration.



Figure 1: PHY receive procedure for Control mode



Figure 2: PHY receive procedure for SU SC and OFDM mode

NOTE – This procedure does not describe the operation of optional features, such as A-PPDU, SU multiple space-time streams, STBC, DCM SQPSK, MIMO SQPSK, and MU reception.

Upon receiving the transmitted PHY preamble overlapping the primary 2.16 GHz channel, the PHY measures a receive signal strength. The PHY indicates this activity to the MAC by issuing a PHY-CCA.indication primitive. A PHY-CCA.indication(BUSY, channel-list) primitive is also issued as an initial indication of reception of a signal as defined in 8.3.5.12. The channel-list parameter of the CCA-PHY.indication primitive is absent when the operating channel width is 2.16 GHz. The channel-list parameter is present and includes the element primary when operating channel width is 4.32 GHz, 6.48 GHz, 8.64 GHz, 2.16+2.16 GHz, or 4.32+4.32 GHz.

The PHY shall not issue a PHY-RXSTART.indication primitive in response to a PPDU that does not overlap the primary 2.16 GHz channel.

The PHY includes the most recently measured RSSI value in the PHY-RXSTART.indication(RXVECTOR) primitive issued to the MAC.

*Editor: add RSSI parameter to RXVECTOR*

**Table 10 – TXVECTOR and RXVECTOR parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Condition** | **Value** | **TXVECTOR** | **RXVECTOR** |
| RSSI | FORMAT is EDMG | The allowed values for the RSSI parameter are in the range 0 through 255. This parameter is a measure by the PHY of the power observed at the input of the antennas plus the antenna gain, or equivalent antenna gain for a phased-array antenna, used to receive the currentPPDU.RSSI shall be measured during the reception of the L-STF or EDMG-STF field.RSSI is intended to be used in a relative manner, and it shall be a monotonically increasing function of the received power with equidistant step equal to 0.25 dB. | N | Y |
| Otherwise | See corresponding entry in Table 20-1 |

After the PHY-CCA.indication(BUSY, channel-list) primitive is issued, the PHY entity shall continue receiving the pre-EDMG part of the PPDU, including L-STF, L-CEF, L-Header, and EDMG-Header-A fields.

For EDMG STA and Control mode PPDU, the L-Header contains the channel bandwidth indication field, the EDMG-Header-A indication field, which implies that the PPDU is an EDMG Control mode PPDU, and control trailer indication field as defined in 30.3.3.2.4, Table 17 and 18.

For EDMG STA and SC or OFDM mode PPDU, the L-Header contains IsSC field indicating the EDMG SC or EDMG OFDM modulation type, IsSISO field indicating the single or multiple spatial streams transmission, GI length field indicating the type of GI used for the Data (PSDU) transmission, compressed bandwidth indication as defined in 30.3.3.2.4, Table 19, 20 and 21.

If the check of the L-Header CRC bits is not valid, a PHY-RXSTART.indication primitive is not issued, and instead the PHY shall issue the error condition PHY-RXEND.indication(FormatViolation) primitive. If a check of the L-Header CRC bits is valid, the EDMG PHY shall maintain the PHY-CCA.indication(BUSY, channel-list) primitive for the predicted duration of the transmitted PPDU, as defined by RXTIME parameter, for all supported modes, unsupported modes, and invalid EDMG-Header-A CRC.

If the check of the EDMG-Header-A CRC bits is not valid, a PHY-RXSTART.indication primitive is not issued, and instead the PHY shall issue the error condition PHY-RXEND.indication(FormatViolation) primitive. For EDMG STA, if the EDMG-Header-A indicates unsupported mode, the PHY shall issue a PHY-RXEND.indication(UnsupportedRate) primitive.

After receiving a valid L-Header and EDMG-Header-A indicating a supported mode, the PHY entity shall begin reception of the EDMG portion of PPDU. For EDMG STA and Control mode PPDU, the EDMG portion of PPDU includes the Data (PSDU) and possible TRN field as defined in 30.4.

For EDMG STA and SC mode PPDU, if SU/MU Format field in EDMG-Header-A indicates a SU PPDU, the Number of SS field indicates a single spatial stream, the STBC Applied field is set to 0, and the BW field indicates a single 2.16 GHz channel, then the EDMG part of the frame includes Data (PSDU) and possible TRN field.

For EDMG STA and SC mode PPDU, if SU/MU Format field EDMG-Header-A indicates a SU PPDU and the Number of SS field indicates multiple spatial streams, or STBC Applied field is set to 1, or the BW field indicates 4.32 GHz, 6.48 GHz, 8.64 GHz, 2.16+2.16 GHz, or 4.32+4.32 GHz channel, then the EDMG part of the frame includes EDMG-STF, EDMG-CEF, Data (PSDU), and possible TRN field as defined in 30.5.

For EDMG STA and OFDM mode PPDU, if SU/MU Format field EDMG-Header-A indicates a SU PPDU, then the EDMG part of the frame includes EDMG-STF, EDMG-CEF, Data (PSDU), and possible TRN field as defined in 30.6.

For EDMG STA and SC or OFDM mode PPDU, if SU/MU Format field EDMG-Header-A indicates a MU PPDU, then the EDMG part of the frame includes EDMG-STF, EDMG-CEF, EDMG-Header-B, Data (PSDU), and possible TRN field as defined in 30.5 and 30.6.

If MU PPDU is indicated in EDMG-Header-A, the EDMG STA verifies the AIDs included into the SS descriptors. If there is no match between the STA’s AID and one provided in any SS descriptor, then PHY shall issue a PHY-RXEND.indication(Filtered) primitive. If AID verification is successful, then STA continues with EDMG-Header-B decoding.

If the check of the EDMG-Header-B CRC bits is not valid, a PHY-RXSTART.indication primitive is not issued, and instead the PHY shall issue the error condition PHY-RXEND.indication(FormatViolation) primitive. For EDMG STA, if the EDMG-Header-B indicates unsupported mode, the PHY shall issue a PHY-RXEND.indication(UnsupportedRate) primitive.

In case of successful decoding of bit content of the L-Header, EDMG-Header-A, and EDMG-Header-B (for MU only), PHY shall issue a PHY-RXSTART.indication(RXVECTOR) primitive to the MAC containing the RXVECTOR parameters as defined in 30.2.2, Table 15.

After successful decoding of the header fields, PHY performs decoding of PSDU and initiates the series of PHY-DATA.indication(DATA) primitive exchanges. The decoded PSDU bits are assembled into the octets and the possible pad bits added at the stage of encoding are discarded. If PSDU decoding is successful, then PHY shall issue the primitive PHY-RXEND.indication(NoError, RXVECTOR).

If signal loss occurs during reception prior to completion of the PPDU reception, the error condition shall be reported to the MAC using a PHY-RXEND.indication(CarrierLost) primitive. After waiting for the intended end of the PPDU as determined by RXTIME parameter, including possible TRN field, the PHY shall generate a PHY-CCA.indication(IDLE) primitive and return to the IDLE state. If the decoding of L-Header is unsuccessful, then the RXTIME parameter cannot be determined. In that case the PHY shall switch to the IDLE state immediately without waiting for the intended end of the PPDU.

A typical receive state machine for SU PPDU reception with NUM\_STS = 1 and no TRN field is shown in Figure 3 below.



Figure 3: PHY receive state machine for SU PPDU reception (NUM\_STS = 1, no TRN field)

For EDMG STA and Control mode PPDU, the RXTIME parameter shall be computed using Length and Training Length fields defined in the L-Header (see Table 20-11). The minimum value for the Length field is equal to 14 octets, the Training Length (TRN-LEN) can be equal to zero. In the latter case, the TRN field is not appended to the PPDU.

The RXTIME parameter shall be defined in (µs) as follows:









where:

* 
*  = 88
* 
* 



For EDMG PPDU transmission, the RXTIME computation using the above equation may cause a spoofing error less than or equal to 0.15 µs, except for PPDU durations between 347.56 µs and 347.93 µs and between 349.10 µs and 350.76 µs where the maximum spoofing error can be 0.37 µs and 1.66 µs, respectively as defined in 30.3.3.2.4.1. Spoofing error is defined as the difference between the PPDU duration calculated based on the L-Header and the actual PPDU duration.

For EDMG STA and SC mode PPDU, the RXTIME parameter shall be computed using Base MCS, Length, Extended SC MCS Indication, and Training Length fields of the L-Header (see Table 20-17).

The RXTIME parameter shall be defined in (µs) as follows:













The number of SC symbol blocks  shall be as defined in 20.6.3.2.3.3.

In case of DMG A-PPDU reception (Additional PPDU bit is set to 1), the RXTIME parameter shall be updated every time when receiving the next L-Header field. In case of EDMG A-PPDU, the RXTIME parameter predicts the reception time for the entire EDMG A-PPDU. In both cases the TRN field can be appended only once at the very end of the A-PPDU.

For EDMG PPDU transmission, the RXTIME computation using the above equation may cause a spoofing error less than one SC symbol block, i.e.  as defined in 30.3.3.2.4.1. Spoofing error is defined as the difference between the PPDU duration calculated based on the L-Header and the actual PPDU duration.

Optionally, an EDMG STA can estimate more accurately the actual RXTIME parameter for EDMG PPDU using EDMG-Header-A fields.

**SP:**

Do you agree to accept the proposed comment resolution for CID 429 as defined in (11-17-1241-00-00ay Proposed Comment Resolution for CID 429 30 8 EDMG Receive Procedure)?

**References:**

1. Draft P802.11ay\_D0.5
2. IEEE802.11-2016