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| 11be PDT: EHT receive procedure |
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Abstract

This contribution proposes the draft text on transmit procedure for TGbe D0.1.

R0:

36.3.20 EHT receive procedure

Typical PHY receive procedures are shown in Figure 36-RxMU (PHY receive procedure for an EHT MU PPDU) and Figure 36-RxTB (PHY receive procedure for an EHT TB PPDU) respectively.



Figure 36-RxMU (PHY receive procedure for an EHT MU PPDU)



Figure 36-RxTB (PHY receive procedure for an EHT TB PPDU)

A typical state machine implementation of the receive PHY is given in Figure 36-RxFlow (PHY receive state machine).



Figure 36-RxFlow (PHY receive state machine)

If the detected format indicates a non-HT PPDU, refer to the receive procedure and state machine in Clause 15 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications), Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification), Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification) and Clause 18 (Extended Rate PHY (ERP) specification). If the detected format indicates an HT PPDU format, refer to the receive procedure and state machine in Clause 19 (High Throughput (HT) PHY specification). If the detected format indicates a VHT PPDU format, refer to the receive procedure and state machine in Clause 21 (Very High Throughput (VHT) PHY specification). If the detected format indicates a HE PPDU format, refer to the receive procedure and state machine in Clause 27 (High Efficiency (HE) PHY specification). Through station management (via the PLME) the PHY is set to the appropriate frequency, as specified in 36.4 (EHT PLME). The PHY has also been configured with BSS identification information and STA identification information (i.e., BSS color value and STA-ID) so that it can receive data intended for the STA in the specific BSS. Other receive parameters, such as RSSI and indicated DATARATE, may be accessed via the PHY-SAP.

Upon receiving the transmitted PHY preamble in a greater than or equal to 20 MHz BSS, the PHY measures a receive signal strength. This activity is indicated by the PHY to the MAC via 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 specified in 36.3.20.6 (CCA sensitivity). The channel-list parameter of the PHY-CCA.indication primitive is absent when the operating channel width is 20 MHz. The channel-list parameter is present when the operating channel width is 40 MHz, 80 MHz, 160 MHz or 320 MHz.

The PHY shall not issue a PHY-RXSTART.indication primitive in response to a PPDU that does not overlap the primary channel unless the PHY at an AP receives the EHT TB PPDU solicited by the AP. For the EHT TB PPDU solicited by the AP, the PHY shall issue a PHY-RXSTART.indication primitive for a PPDU received in the primary or at the secondary 20 MHz channel, the secondary 40 MHz channel, the secondary 80 MHz channel or the secondary 160 MHz channel.

The PHY includes the measured RSSI and RSSI\_LEGACY value in the PHY-RXSTART.indication(RXVECTOR) primitive issued to the MAC.

After the PHY-CCA.indication(BUSY, channel-list) primitive is issued, the PHY entity shall begin receiving the training symbols and searching for L-SIG in order to set the maximum duration of the data
stream. Then the PHY will search for the preambles for non-HT, HT, VHT, HE, and EHT PPDUs respectively. If the constellation used in the first symbol after the first long training field is QBPSK, the PHY entity shall continue to detect the received signal using the receive procedure for HT-GF depicted in Clause 19. For detecting the EHT preamble, the PHY entity shall search for RL-SIG and evaluate the LENGTH field. If RL-SIG is detected, the PHY entity should check the parity bit and RATE fields in L-SIG and RL-SIG. If either the check of the parity bit is invalid or the RATE field is not set to 6 Mb/s, a PHY-RXSTART.indication primitive is not issued. If the check of the parity bit is valid and the RATE field indicates 6 Mb/s but the LENGTH field value in L-SIG is a not a multiple of 3, a PHY-RXSTART.indication primitive is not issued. In both cases, the PHY should continue to detect the received signal using non-HT, HT, VHT and HE receive procedure in Clauses 17, 19, 21 and 27 respectively.

If a valid parity bit and the RATE with 6 Mb/s are indicated in L-SIG and RL-SIG and the LENGTH field value in L-SIG and RL-SIG is a multiple of 3, the PPDU is an EHT PPDU. PHY entity shall begin receiving the U-SIG. The PHY entity shall check the constellation of the 2nd symbol of the U-SIG. If the constellation is QBPSK, the PHY entity shall receive the U-SIG and the repeated U-SIG which are the two symbols after U-SIG (4 symbols in total following the RL-SIG). If the constellation is BPSK, the PHY entity shall receive the U-SIG (2 symbols in total following the RL-SIG). Then the PHY entity shall check the CRC of the U-SIG field (and Repeated U-SIG field if present).

* If the U-SIG field indicates a valid CRC, the PHY entity shall report the version independent fields in the U-SIG (e.g. TXOP, BSS color and BW) to the MAC entity.
* If the U-SIG field indicates a valid CRC, and the PHY Version Identifier or the BSS color or the UL/DL does not contain an intended value, or the constellation of the 2nd symbol of the U-SIG is QBPSK, PHY entity shall issue a PHY-RXSTART.indication(RXVECTOR) then issue a PHY-RXEND.indication(Filtered).
* If the U-SIG field indicates a valid CRC and the U-SIG field indicates a Reserved-Validate U-SIG indication, the PHY shall issue the error condition PHY-RXEND.indication(FormatViolation) primitive and maintain PHY-CCA.indication(BUSY, channellist) primitive for the predicted duration of the transmitted PPDU derived from the LENGTH field in L-SIG as defined in Equation (36-1yy) unless it receives a PHY-CCARESET.request primitive before the end of the PPDU for instance during spatial reuse operation as described in 36.10 (Spatial reuse operation). A Reserved-Validate U-SIG indication is defined as TBD or any other U-SIG field bit combinations that do not correspond to modes of PHY operation defined in Clause 36 (High Efficiency (EHT) PHY specification).
* If the U-SIG field indicates a valid CRC and the U-SIG field indicates a Reserved-Ignore U-SIG indication, the PHY entity shall continue processing the U-SIG and behave as if a reserved U-SIG indication is not indicated. A Reserved-Ignore U-SIG indication is defined as TBD.
* If the U-SIG field indicates an invalid CRC, the PHY shall issue the error condition PHY-RXEND.indication(FormatViolation) primitive and maintain PHY-CCA.indication(BUSY, channellist) primitive for the predicted duration of the transmitted PPDU derived from the LENGTH field in L-SIG as defined in Equation (36-1yy), unless it receives a PHY-CCARESET.request primitive before the end of the PPDU for instance during spatial reuse operation as described in 36.10 (Spatial reuse operation).

 (36-1yy)

where

LENGTH is the LENGTH field in L-SIG

*SignalExtension* is defined in Table 27-55 (EHT PHY characteristics)

If the CRC check in U-SIG valid, and PHY Version Identifier, the BSS color and the UL/DL each indicates an intended value, and a Reserved-Validate U-SIG indication is not indicated, then the PHY entity will parse the PPDU Type & Compression Mode subfield and the DL/UL subfield in the U-SIG and identify the EHT PPDU type.

**If the received PPDU is EHT MU PPDU,** the PHY entity shall begin receiving the EHT-SIG, EHT-STF, and EHT-LTF for EHT MU PPDU as shown in Figure 36-MuRx (PHY receive procedure for an EHT MU PPDU). The PHY entity shall check the CRC of the Common field of EHT-SIG.

* If the CRC in the Common field of EHT-SIG is valid, for all supported modes, unsupported modes and Reserved-Validate indication, the PHY entity shall maintain PHY-CCA.indication(BUSY, channellist) primitive for the predicted duration of the transmitted PPDU, as defined by RXTIME in Equation (36-1xx), unless it receives a PHY-CCARESET.request primitive before the end of the PPDU for instance during spatial reuse operation as described in 36.TBD (Spatial reuse operation). A Reserved-Validate EHT-SIG indication is defined as a Reserved-Validate subfield in the user field (associated with a Non-MUMIMO allocation) equals to 0, or the Coding subfield in the user field (associated with a MUMIMO allocation for RU/MRU size greater than 242 tone) equals to 0.
* If the CRC in the Common field of EHT-SIG is valid, the PHY entity shall search for intended STA-ID in each User Field. If an intended STA-ID is detected in a user block or in the common field (only if the PPDU type and compression mode and UL/DL indicate a DL Non-OFDMA compressed mode) with valid CRC, and an unsupported mode or a Reserved-Validate EHT-SIG indication is not indicated, the PHY entity shall continue receiving the EHT-STF right after the EHT-SIG.
* If the CRC in the Common field of EHT-SIG is valid and no intended STA-ID is detected in all the user fields, the PHY entity shall issue a PHY-RXSTART.indication(RXVECTOR) then issue a PHY-RXEND.indication(Filtered).
* If the CRC in the Common field of EHT-SIG is valid and an intended STA-ID is detected, but an unsupported mode or a Reserved-Validate EHT-SIG indication is indicated in EHT-SIG field, the PHY shall issue a PHY-RXSTART.indication(RXVECTOR) then issue a PHY-RXEND.indication(UnsupportedRate) primitive.
* If the CRC in the common field of EHT-SIG is not valid, the PHY shall issue the error condition PHY-RXEND.indication(FormatViolation) primitive and maintain PHY-CCA.indication(BUSY, channellist) primitive for the predicted duration of the transmitted PPDU derived from the LENGTH field in L-SIG as defined in Equation (36-1yy) unless it receives a PHY-CCARESET.request primitive before the end of the PPDU for instance during spatial reuse operation as described in 36.TBD (Spatial reuse operation).

**If the received PPDU is EHT TB PPDU** the PHY entity shall continue receiving the EHT-STF, and EHT-LTF for an EHT TB PPDU shown in Figure 36-RxTB (PHY receive procedure for an EHT TB PPDU). If a STA receives an EHT TB PPDU and the TRIGVECTOR parameters are not present in its PHY entity, the STA shall use Equation (36-1yy) to calculate the predicted duration of the EHT TB PPDU.(#24020)

If signal loss occurs during reception prior to completion of the PSDU reception, the error condition PHY-RXEND.indication(CarrierLost) shall be reported to the MAC. After waiting for the end of the PPDU as determined by Equation (36-1xx) the PHY shall set the PHY-CCA.indication (IDLE) primitive and return to the RX IDLE state.

$RXTIME\left(µs\right)=20+T\_{EHT\\_PREAMBLE}+N\_{SYM}T\_{SYM}+T\_{PE}+SignalExtension$ (36-1xx)

where

*T*EHT-PREAMBLE, *NSYM* and *TPE* are defined in Equation (36-82), Equation (36-80) and Equation (36-81), respectively.

*SignalExtension* is defined in Table 27-55 (EHT PHY characteristics).

Except in an EHT sounding NDP, a Data field follows the EHT-STF and EHT-LTF fields. The number of symbols in the Data field and the packet extension duration are computed from Equation (36-80) and Equation (36-81), respectively.

The received PSDU bits are assembled into octets, decoded, and present to the MAC using a series of PHY-DATA.indication(DATA) primitive exchanges. Any final bits that cannot be assembled into a complete octet are considered pad bits and discarded. After the reception of the final bit of the last PSDU octet, and possible padding and tail bits, the PHY entity shall check whether packet extension and/or signal extension is applied. If packet extension and/or signal extension is applied, the PHY entity shall wait until the packet extension and/or signal extension expires before returning to the RX IDLE state, as shown in Figure 36-RxFlow (PHY receive state machine).