IEEE P802.11
Wireless LANs

|  |
| --- |
| Miscellaneous HE PHY Corrections |
| Date: 2016-10-27 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Lochan Verma | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92121 | +1-858-845-7832 | lverma@qti.qualcomm.com |
| Sameer Vermani | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92121 | +1-858-845-3115 | svverman@qti.qualcomm.com |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission fixes miscellaneous HE PHY issues in D0.5.

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Fixed typos and language clean-up

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

*Changes to D0.5:*

1. **Remove TBDs in Fig. 9-52c (Trigger Frame)**

***TGax Editor: Replace TBDs in Fig. 9-52c as follows.***

TBD associated with Common Info: Replace with ‘8 or more’

TBDs associated with User Info: Replace with ‘5 or more’

1. **Replace ‘LDPC Extra Symbol’ with ‘LDPC Extra Symbol Segment’ throughout the Draft 0.5.**

Note that if ‘LDPC Extra symbol’ is set to 1 then increment one segment (a = a\_init + 1), instead of one long symbol. Hence ‘LDPC Extra symbol segment’ is more accurate description.

***TGax Editor: Replace ‘LDPC Extra Symbol’ with ‘LDPC Extra Symbol Segment’ throughout the D0.5.***

1. ***Remove Editor’s Note and surplus text***

***TGax Editor: Replace Pg 34, delete Editor’s Note on ln 11- 14. Pg 34, delete ln 15-19.***

 Note that the text in ln 15 -19 is accurately described in ln 20 – 25.

1. **Value 127 is not reserved but used to indicate that STA is operating at its maximum transmit power. Correct Table 9-25g (Target RSSI subfield encoding)**

***TGax Editor: Edit the Table 9-25g (Target RSSI subfield encoding) as follows.***

|  |  |
| --- | --- |
| Target RSSI Subfield | Description |
| 0 - 90 | Values 0 to 90 map to -100 dBm to -20 dBm |
| 91 - ~~127~~126 | Reserved |
| 127 | Indicates to the STA to transmit an HE trigger-based\_PPDU response at its maximum transmit power for the assigned MCS |

1. **Provide correct Section references.**

***TGax Editor: Edit the text on Pg 36, ln 3 as follows.***

The encoding of the MCS field is as defined in Section ~~XXX~~26.3.7.

***TGax Editor: Edit the text on Pg 36, ln 9 as follows.***

A value of 1 indicates that the HE trigger-based PPDU response shall use DCM as defined in Section ~~XXX~~26.3.11.15.

1. **Delete duplicate HE Capabilities.**

Discussion:

‘Downlink MU-MIMO on Partial Bandwidth Rx’ in Fig. 9-589ck (HE MAC Capabilities Information field format) is duplicate of ‘DL MU-MIMO on Partial Bandwidth’ in Fig. 9-589cl (HE PHY Capabilities Information field format).

‘UL MU-MIMO’ in Fig. 9-589ck (HE MAC Capabilities Information field format) is duplicate of ‘UL MU’ in Fig. 9-589cl (HE PHY Capabilities Information field format).

‘UL HE MU PPDU over 106-tone RU’ prohibits the reception of UL HE MU PPDU with SU payload on RU size > 106-tone. The agreement is reception of UL HE MU PPDU payload at the AP is optional for full bandwidth and partial bandwidth. A non-AP STA can optionally support transmission of UL HE MU PPDU on 106-tone RU.

‘Partial Bandwidth SU Feedback Support’ B63 is covered by description of ‘Beamforming Feedback with Trigger Frame’ B56-58 in Fig. 9-589cl (HE PHY Capabilities Information field format).

‘Partial Bandwidth MU Feedback Support’ B64 is covered by description of ‘Beamforming Feedback with Trigger Frame’ B56-58 in Fig. 9-589cl (HE PHY Capabilities Information field format).

‘CQI Feedback Support’ B65 is covered by description of ‘Beamforming Feedback with Trigger Frame’ B56-58 in Fig. 9-589cl (HE PHY Capabilities Information field format).

Capability indicating support of optional power boost factor $α\_{r}$ in the range [0.5, 2] is missing.

***TGax Editor: Edit the B29 – B39 in Fig 9-589ck* (HE MAC Capabilities Information field format) as follows.**

|  |  |  |
| --- | --- | --- |
| ***~~B29~~*** | ***~~B30~~***  | ***~~B32~~B29*** B39 |
| ~~Downlink MU-MIMO on Partial Bandwidth Rx~~ | ~~UL MU-MIMO~~ | Reserved |
| ~~1~~ | ~~2~~ | ~~8~~10 |

***TGax Editor: Delete second last row ‘Downlink MU-MIMO on Partial Bandwidth Rx’ and last row ‘UL MU-MIMO’ in Table 9-262z (Subfields of the HE MAC Information field format)***

***TGax Editor: In Fig. 9-589cl (HE PHY Capabilities Information field format) replace B30 ‘UL HE MU PPDU Payload over 106-tone RU’ with ‘UL HE MU PPDU Payload Support’***

***TGax Editor: In Table 9-262aa (Subfields of the HE PHY Information field format) edit the description of B30 ‘UL HE MU PPDU Payload over 106-tone RU’ on Pg 68, ln 26.***

|  |  |  |
| --- | --- | --- |
| UL HE MU PPDU Payload ~~over 106-tone RU~~ Support | It indicates STA support of reception of HE MU PPDU payload over ~~a 106-tone RU within 20 MHz~~ full bandwidth and partial bandwidth (106-tone RU within 20 MHz). | Set to 1 if supported by the STA. Set to 0 ~~otherwise.~~ if not supported by the STA. This field is reserved for a non-AP STA. |

***TGax Editor: Edit the B63 – B71 in Fig. 9-589cl (HE PHY Capabilities Information field format) as follows.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***B63*** | ***~~B64~~*** | ***~~B65~~*** | ***~~B66~~ B64 B71*** |
|  | ~~Partial Bandwidth SU Feedback Support~~Power boost factor $α\_{r}$ Support | ~~Partial Bandwidth SU Feedback Support~~ | ~~CQI Feedback Support~~ | Reserved |
| ***Bits*** | 1 | ~~1~~ | ~~1~~ | ~~6~~ 8 |

***TGax Editor: In Table 9-262aa (Subfields of the HE PHY Information field format) delete last three rows corresponding to ‘Partial Bandwidth SU Feedback Support’, ‘Partial Bandwidth MU Feedback Support’, and ‘CQI Feedback Support’ Pg 70, Ln 16- 28.***

***TGax Editor: In Table 9-262aa (Subfields of the HE PHY Information field format) add the following description at the end.***

|  |  |  |
| --- | --- | --- |
| ***Subfield*** | ***Description***  | ***Encoding*** |
| Power Boost factor$ α\_{r}$ | It indicates STA supports power boost factor $α\_{r}$ for the r-th RU in the range [0.5, 2] | Set to 1 if supported by the STA. Set to 0, otherwise.  |

***TGax Editor: Edit the NOTE on Pg 67, ln 51, in Table 9-262aa* (subfields of the HE PHY Capabilities Information field) as follows.**

NOTE: If the non-AP STA sets B23 (Uplink MU-MIMO on Partial Bandwidth) to 0, it shall support transmitting SU RU within an HE MU PPDU where some other RU is employing UL ~~DL~~ MU-MIMO

***TGax Editor: Change the paragraphs below of 25.5.2.1 (General) as follows:***

An HE STA with dot11ULMUMIMOOptionImplemented set to true shall set B22 of the UL MU ~~MIMO~~ (#1507) subfield of the HE Capabilities element it transmits to 1. Otherwise, the HE STA shall set B22 of the UL MU ~~MIMO~~ subfield of the HE Capabilities element it transmits to 0(#417).

A non-AP STA with dot11ULMUMIMOOptionImplemented equal to true is referred to as an UL MU capable STA.

An HE STA shall set the UL MU Response Scheduling Support subfield of the HE Capabilities element it transmits to 1 if its dot11HEULMUResponseSchedulingOptionImplemented is true; otherwise the STA shall set it to 0.(#1)

A STA shall not transmit a Trigger frame ~~soliciting a Full BW UL MU MIMO PPDU~~ assigning an MU-MIMO RU in an UL OFDMA PPDU when the  RU does not span the entire PPDU BW, to a ~~from a~~ STA from which it has not received an HE Capabilities element with B23 of the~~UL OFDMA With MIMO Support bit~~ UL MU subfield set to 1.

A STA shall not transmit a Trigger frame soliciting a Full BW UL MU MIMO PPDU from a STA from which it has not received from which it has not received an HE Capabilities element with B22 of the UL MU ~~MIMO Support bit~~ subfield set to 1.

1. **Section 26.3.1 (HE PHY Introduction) is empty**

***TGax Editor: Add the paragraph below under 26.3.1 (Introduction):***

This subclause provides the procedure by which PSDUs are converted to and from transmissions on the wireless medium.

During transmission, a PSDU (in the SU case) or one or more PSDUs (in the MU case) are processed (i.e., scrambled and coded) and appended to the PHY preamble to create the PPDU. At the receiver, the PHY preamble is processed to aid in the detection, demodulation, and delivery of the PSDU.

1. **Consistency of language between 25.6 (HE Sounding) and 26.3.15.2 (Beamforming Feedback Matrix V)**

***TGax Editor: On Pg 287, ln 40 – 45, change as follows:***

The number of bits for quantization, tone grouping factor, and the number of columns in the HE Compressed beamforming feedback as set by the beamformee, i.e., non-AP STA, only if the HE NDPA frame ~~is addressed to a single non-AP STA and SU type feedback is solicited~~ contains only one STA info element."

1. **Section 26.3.3.7.3 (Maximum number of total spatial streams in an HE MU PPDU) is not needed. The text is already present in 26.3.3.7.2 (Maximum number of spatial streams in an HE MU PPDU)**

***TGax Editor: Delete Section 26.3.3.7.3 and its text, pg. 188, ln 49 – 55.***

1. **Codebook size description {**$ϕ,ψ$**} not consistent throughout the D0.5**

***TGax Editor: Edit Table 9-25a (Feedback Type and Ng subfield and Codebook Size subfield encoding)***

|  |  |
| --- | --- |
| Feedback Type + Ng + codebook size | Decription |
| 000 | SU, Ng4, quantization resolution ($ϕ,ψ$) = {4,2}~~{2,4}~~ |
| 001 | SU, Ng4, quantization resolution ($ϕ,ψ$) = {6,4}~~{4,6}~~ |
| 010 | SU, Ng16, quantization resolution ($ϕ,ψ$) = {4,2}~~{2,4}~~ |
| 011 | SU, Ng16, quantization resolution ($ϕ,ψ$) = {6,4}~~{4,6}~~ |
| 100 | MU~~+~~, Ng4, quantization resolution ($ϕ,ψ$) = {7,5}~~{5,7}~~ |
| 101 | MU~~+~~, Ng4, quantization resolution ($ϕ,ψ$) = {9,7}~~{7,9}~~ |
| 110 | CQI only feedback |
| 111 | MU~~+~~, Ng16, quantization resolution ($ϕ,ψ$) = {9,7} ~~{7,9}~~ |

***TGax Editor: Edit Table 9-76a (HE MIMO Control field encoding) entry ‘Codebook Information’ pg 45, ln 58***

***NOTE- The codebook size for MU feedback with Ng = 16 is limited to*** ($ϕ,ψ$) = {9,7}

***TGax Editor: Edit text on Pg 51, ln 38 -48 as follows.***

For an HE beamformee, supporting the codebook size ($ϕ,ψ$) = {4, 2} in the HE Compressed Beamforming Report field is optional for SU feedback type(#Ed). A beamformer shall not request codebook size ($ϕ,ψ$) = {4, 2} in an HE NDP Announcement frame(#Ed) if the beamformee does not indicate support for the codebook size ($ϕ,ψ$) = {4, 2} in the HE Capabilities element it transmits (see 9.4.2.218 (HE Capabilities element)). For an HE beamformee, supporting codebook size {7, 5} in the HE Compressed Beamforming Report field is optional for MU feedback type(#Ed). A beamformer shall not request the codebook size ($ϕ,ψ$) = {7, 5} in an HE NDP Announcement frame if the beamformee does not indicate support for the codebook size ($ϕ,ψ$) = {7, 5} in the HE Capabilities element it transmits (see 9.4.2.218 (HE Capabilities element)).

***TGax Editor: Edit the B63 – B71 in Fig. 9-589cl (HE PHY Capabilities Information field format) as follows.***

Bit B54 ‘Codebook size {4,2} for SU Support’ replace with ‘Codebook size ($ϕ,ψ$) ={4,2} for SU Support’

Bit B55 ‘Codebook size {7,5} for MU Support’ replace with ‘Codebook size ($ϕ,ψ$) ={7,5} for MU Support’

***TGax Editor: In Table 9-262aa (Subfields of the HE PHY Information field format)***

|  |  |  |
| --- | --- | --- |
| Subfield | Description | Encoding |
| Codebook size ($ϕ,ψ$) ={4,2} for SU Support | Indicates if the HE beamformee is capable of feedback with codebook size ($ϕ,ψ$) = {4, 2} in the HE Compressed Beamforming Report field for a SU-type feedback | Set to 1 if supported. Set to 0 otherwise. |
| Codebook size ($ϕ,ψ$) ={7,5} for MU Support’ | Indicates if HE beamformee is capable of feedback with codebook size size ($ϕ,ψ$) ={7, 5} in the HE Compressed Beamforming Report field for a MU-type feedback. | Set to 1 if supported. Set to 0 otherwise. |

**References:**

1. **IEEE P802.11axTM/D0.5, September 2016.**