IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comment Resolutions on PHY INTRODUCTION  Part 2 | | | | |
| Date: 2018-01-10 | | | | |
| 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 |
| Youhan Kim |  |  | youhank@qca.qualcomm.com |
| Bin Tian |  |  | btian@qti.qualcomm.com |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes resolutions for the following comments on section 28.1.1 of TGax D2.0:

13622, 13628, 13629, 13837, 13979,

13980, 13981, 13982, 13992, 13993,

14002, 14004, 14007, 14008, 14009,

14010, 14012, 13565, 13566, 14013,

14005

Revisions:

* Rev 0: Initial version of the document.

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.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause Number** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 13622 | 28.1.1 | 327.65 | Midamble is an important new feature included in D2.0. It shall be introduced in the introduction subclause in 28.1.1 | Add a paragraph “The HE PHY provides support for idamble to improve the performance for channel suffering from Doppler …” | Revised—  Midamble is now described in the HE PHY introduction.  Tgax Editor to make the changes for CID13622 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13628 | 28.1.1 | 327.32 | In case the 20MHz-only non-AP HE STA is operating in the 5GHz band, it shall support VHT PHY as well. | The HE PHY with 20 MHz-only capability (see 28.3.9 (Mathematical description of signals)) is based on the VHT PHY defined in Clause 21 (Very High Throughput (VHT) PHY specification), which in turn is based on the HT PHY defined in Clause 19 (High Throughput (HT) PHY specification), which in turn is based on the OFDM PHY defined in Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification). | Revised—  20 MHz-only non-AP HE STA shall support transmission and reception of 20 MHz HT and VHT PPDUs in 5 GHz. This is stated in Pg/ln, 327/19.  The sentence under question (“The HE PHY with 20 MHz-only capability is based on the HT PHY..”) is misleading.  Tgax Editor to make the changes for CID13628 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13629 | 28.1.1 | 327.48 | There are many types of resource units. Depending on unit type, may not zero out more than one RU, it can be one 242 tone RU to zero out. | For channel widths greater than or equal to 80 MHz, the HE PHY supports preamble puncturing transmissions where one or more of the non-primary 20 MHz channels in an HE MU PPDU with more than one resource unit (RU) are zeroed out. | Revised—  Agree with commenter that depending upon RU unit type, a 20 MHz channel has one or more RUs.  Tgax Editor to make the changes for CID13629 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13837 | 28.1.1 | 327.32 | “The HE PHY with 20 MHz-only capability (see 28.3.9 (Mathematical description of signals)) is based on the HT PHY defined in Clause 19, which in turn is based on the OFDM PHY defined in Clause 17.”  While this seems to be valid assumptions for the 20 MHz-only STAs, it is not clear whether a 20 MHz-only STA is a VHT STA. Since it is mandatory for a VHT STA to support operation in 80 MHz channel width, it is not clear if a 20 MHz-only STA will be a VHT STA. | Definition of 21 MHz-only non-AP STA may have to be changed if it is supposed to be a VHT STA. | Revised—  Please refer to CID 13628 discussion and resolution of CID 13837 |
| 13979 | 28.1.1 | 327.46 | Whether preamble puncturing can be applied is a function of PPDU BW, not channel BW. For example, a 40 MHz PPDU transmitted within an 80 MHz channel bandwidth cannot use preamble puncturing | Change “For channel widths greater than or equal to 80 MHz” to “For PPDU bandwidths greater than or equal to 80 MHz”. | Revised—  Agree with the comment.  Tgax Editor to make the changes for CID13979 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13980 | 28.1.1 | 327.47 | This sentence does not allow puncturing only one RU. | Change “with more than one resource unit (RU) are zeroed out” to “with at least one resource unit (RU) zeroed out”. | Revised—  Agree with the comment.  Tgax Editor to make the changes for CID13980 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13981 | 28.1.1 | 327.54 | HE-LTF duration includes GI duration as well | Change “provides support for 3.2” to “supports DFT periods of 3.2”. | Revised—  Agree with the comment.  Tgax Editor to make the changes for CID13981 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13982 | 28.1.1 | 327.55 | HE modulated fields includes HE-LTF, which supports 6.4 us DFT period as well. | Change “The HE PHY supports a DFT period of 3.2 ++s and 12.8 ++s for the pre-HE modulated fields and the HE modulated fields in an HE PPDU, respectively.” To “The HE PHY supports DFT periods of 3.2 us for the pre-HE modulated fields and the HE Data field, respectively, in an HE PPDU.” | Revised—  Agree with the comment.  Tgax Editor to make the changes for CID13982 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13566 | 28.1.1 | 327.55 | For crystal clear clarification, specify 3.2us and 12.8us DFT period separately for pre-HE/HE fields. | Change ‘3.2us and 12.8us for the pre-HE modulated fields and the HE modulated fields in an HE PPDU, respectively.’ To ‘3.2us for the pre-HE modulated fields and 12.8us for the HE modulated fields in an HE PPDU, respectively.’ | Revised—  CID 13981 and CID 13982 alter the text under question by this CID.  Please refer to resolution of CID 13981 and CID 13982 for resolution of CID 13566. |
| 13565 | 28.1.1 | 327.36 | The max number of DL-MU-MIMO as eight is per RU. If you use OFDMA+MU-MIMO, total number of DL-MU-MIMO users will be increased depending on the number of RUs (e.g., upto 128 in 80MHz HE MU PPDU), this max number should be clarified per RU | Change 'trnasmissions to eight' to 'transmissions to eight per one resource unit' | Accept— |
| 13992 | 28.1.1 | 328.25 | A STA does not declare the BW of the HE SU PPDUs it can support. Rather it declares the supported channel banwdiths. | Change "if the STA supports transmitting and receiving HE SU PPDUs of bandwidths greater than 20 MHz" to "if the STA supports operating in channel bandwidths greater than 20 MHz" | Revised—  Agree with the comment.  TGax Editor to make the changes for CID13992 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 13993 | 28.1.1 | 328.28 | As is written, it looks as if one could build an HE PHY which supports LDPC TX but not LDPC RX. But HE PHY Capabilities has one bit to indicate LDPC support for both TX and RX. | Change P328L28-32 to "LDPC coding (transmit and receive) in all supported HE PPDU types, RU sizes, and number of spatial streams if the STA declares support for transmitting or receiving more than 4 spatial streams" | Revised—  Agree with the comment.  TGax Editor to make the changes for CID13993 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 14002 | 28.1.1 | 329.09 | As is written, it looks as if one could build an HE PHY which supports LDPC TX but not LDPC RX. But HE PHY Capabilities has one bit to indicate LDPC support for both TX and RX. | Change "- LDPC coding (transmit) if the maximum number of spatial streams the STA is capable of transmitting in an HE SU PPDU is less than or equal to 4 - LDPC coding (receive) if the maximum number of spatial streams the STA is capable of receiving in an HE SU PPDU is less than or equal to 4" to "- LDPC coding (transmit and receive) if the maximum number of spatial streams the STA is capable of transmitting or receiving in an HE SU PPDU is less than or equal to 4" | Revised—  CID 13993 and CID 14002 are similar in nature.  TGax Editor to make the changes for CID14002 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 14004 | 28.1.1 | 330.20 | A non-AP HE STA cannot transmit any HE MU PPDU. It can transmit only a single RU - full BW or 106 tones. | Change "Transmission of HE MU PPDU" to "Transmission of HE MU PPDUs with a single RU spanning the entire PPDU bandwidth, or 20 MHz HE MU PPDUs with a single RU with 106 tones in the Primary 20 MHz channel" | Revised—  Agree in principle.  TGax Editor to make the changes for CID14004 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 14007 | 28,1,1 | 330.44 | "total of up to 8 space-time streams" could be mistaken to mean that a non-AP STA need to transmit 8SS. | Change "If it is supported ... are supported" to "If supported, then the non-AP STA shall support transmitting UL MU-MIMO in which the total space-time streams summed across all users are up to 8." at both P330 L44 and L47. | Accept— |
| 14008 | 28.1.1 | 330.52 | The assigned RU is in the Primary 80 MHz. | Add ", where the assigned RU is within the Primary 80 MHz channel" at the end of P330L52. | Accept— |
| 14009 | 28.1.2 | 330.65 | What about Clauses 15, 16 and 18? | Add clauses 15, 16 and 18 to the list. | Revised—  HE STA logically contains Clause 15,16,17,18,19,21, and 28.  TGax Editor to make the changes for CID14009 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 14010 | 28.1.2 | 331.01 | 20 MHz-only non-AP STA also supports transmission and reception of 20 MHz VHT PPDUs. | Change "A non-AP STA with 20 MHz-only capability supports a mixture of HE, Clause 19 and Clause 17 PHYs" to "A 20 MHz-only non-AP HE STA supports a mixture of HE, Clause 19 and Clause 17 PHYs, and also supports transmission and reception of VHT PPDUs of 20 MHz PPDU bandwidth." | Accept— |
| 14012 | 28.1.4 | 331.44 | NON\_HT in 2.4 GHz is Clause 18. | Change "Clause 17 and including non-HT duplicate format" to "Clause 17 or Clause 18, and including non-HT duplicate format" | Accept— |
| 14013 | 28.1.4 | 331.53 | All the HE PPDU formats are listed as mandatory here, and yet, it is not that simple according to 28.1.1 - there are many conditions. It is not going to be trivial to list out the conditions here again, nor is it necessary to repeat here. | Delete "Support for HE XYZ PPDU format is mandatory" (where XYZ = SU, ER SU, MU, TB) from P331 L54, 57, 60, 65. | Revised—  Agree in principle.  TGax Editor to make the changes for CID14013 as suggested in proposed resolution in IEEE 802.11-18/0037r0 |
| 14005 | 28.1.1 | 330.25 | 20 MHz-only non-AP HE STA operates in the Primary 20 MHz channel | Change "in 40 MHz channel width" to "in the Primary 20 MHz channel within 40 MHz channel width" at P330L25. Change "in 160 MHz and 80+80 MHz channel widths" to "in the Primary 20 Mhz channel within 160 and 80+80 MHz channel widths" at P330L29. | Accept—  A 20 MHz operating non-AP HE STA shall operate in the primary 20 MHz channel (Pg 366, ln 27). Hence the changes suggested by the comment are accurate. |

**==============================================================================**

**Resolution for CID 13622**

**TGax Editor: Please make the following changes to section 28.1.1 (CIDs: 13622)**

**28.1.1 Introduction to the HE PHY**

**….Forward error correction (FEC) coding (convolutional or LDPC coding) is used with coding rates of ½, 2/3, ¾, and 5/6.**

**The HE PHY supports to apply midambles for HE PPDU transmissions in channels with high Doppler.** (#13622)

**…..**

**An HE STA may support the following features:**

* **…**
* **STBC (transmit and receive)**
* HE PPDUs with midamble (transmit and receive) (#13622)

**=============================================================**

**Resolution for CID 13628**

**TGax Editor: Please make the following changes to section 28.1.1 Pg/ln 327/27 (CIDs: 13628)**

The HE PHY ~~with greater than or equal to 80 MHz capability~~ (#13628) is based on the VHT PHY defined in Clause 21 (Very High Throughput (VHT) PHY specification), which in turn is based on the HT PHY defined in Clause 19 (High Throughput (HT) PHY specification), which in turn is further based on the OFDM PHY defined in Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification). ~~The HE PHY with 20 MHz-only capability (see 28.3.9 (Mathematical description of signals)) is based on the HT PHY defined in Clause 19, which in turn is based on the OFDM PHY defined in Clause 17.~~ (#13628)

===========================================================================

**Resolution for CID 13629, 13979, 13980**

**TGax Editor: Please make the following changes to section 28.1.1 Pg/ln 327/47 (CIDs: 13629, #13979)**

…For ~~channel widths~~ PPDU bandwidths (#13979) greater than or equal to 80 MHz, the HE PHY supports preamble puncturing transmissions where one or more of the non-primary 20 MHz channels in an HE MU PPDU with at least one ~~more than one~~ resource unit (RU) (#13629, #13980) are zeroed out.

**…**

**============================================================**

**Resolution of CID 13981, 13982**

**TGax Editor: Please make the following changes to section 28.1.1 (pg 327, ln 54) (CIDs: 13981, 13982)**

**…**

**~~The HE PHY provides support for 3.2 us (1x), 6.4 us (2x), and 12.8 us (4x) HE-LTF durations.~~ (#13981)The HE PHY supports DFT period of 3.2 us and 12.8 us for the pre-HE modulated fields and the HE ~~modulated~~Data (#13882) field~~s~~ in an HE PPDU, respectively. The HE PHY supports DFT period of 3.2 us (1x), 6.4 us (2x), and 12.8 us (4x) for the HE-LTF. (#13981,#13982)**

**…**

**Resolution of CID 13992**

**TGax Editor: Please make the following changes to section 28.1.1 (pg 328, ln 25) (CIDs: 13992)**

**…**

**-**LDPC coding (transmit and receive) in all supported HE PPDU types, RU sizes, and number of spatial streams if the STA supports transmitting and receiving ~~HE SU PPDUs of bandwidths~~ in channel bandwidths greater than 20 MHz (#13992)

====================================================================================

**Resolution of CID 13993, 14002**

**TGax Editor: Please make the following changes to section 28.1.1 (pg 328, ln 28) (CIDs: 13993,** 14002**)**

An HE STA shall support the following features:

-….

-LDPC coding (transmit and receive) in all supported HE PPDU types, RU sizes, and number of spatial streams if the STA declares support for transmitting or receiving more than 4 spatial streams (#13993)

-~~LDPC coding (receive) in all supported HE PPDU types, RU sizes, and number of spatial streams if the STA declares support for receiving more than 4 spatial streams~~(#13993)

-…

An HE STA may support the following features:

-…

-LPDC coding (transmit and receive) if the maximum number of spatial streams the STA is capable of transmitting or receiving in an HE SU PPDU is less than or equal to 4 (#14002)

-~~LDPC coding (receive) if the maximum number of spatial streams the STA is capable of receiving in an HE SU PPDU is less than or equal to 4~~ (#14002)

===================================================================================

**Resolution of CID 14004**

**TGax Editor: Please make the following changes to section 28.1.1 (pg 328, ln 28) (CIDs: 14004)**

An HE AP may support the following features:

* Reception ~~of the payload~~ on an RU in an HE MU PPDU where RU spans the entire PPDU bandwidth or a 106-tone RU within primary 20 MHz PPDU bandwidth (#14004)

A non-AP HE STA may support the following features:

* ~~Transmission of an HE MU PPDU~~ Transmission on an RU in an HE MU PPDU where RU spans the entire PPDU bandwidth or a 106-tone RU within primary 20 MHz PPDU bandwidth (#14004)

**============================================================**

**Resolution of CID 14009**

**TGax Editor: Please make the following changes to section 28.1.1 (pg 328, ln 28) (CIDs: 14009)**

**28.1.2 Scope**

b) A function that defines the characteristics and method of transmitting and receiving data through a wireless medium between two or more STAs. Depending on the PPDU format, these STAs support a mixture of HE, Clause 21 (Very High Throughput (VHT) PHY specification), Clause 19 (High Throughput (HT) PHY specification), Clause 18 (Extended Rate PHY (ERP) specification), ~~and~~ Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification), Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification), and Clause 15 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) PHYs (#14009). A non-AP STA with 20 MHz-only capability supports a mixture of HE, Clause 19 and Clause 17

PHYs.

**Discussion on CID 14013**

Support of XYZ PPDU format where XYZ = SU, ER SU, MU, TB, is different for Tx and Rx. E.g., Tx of HE MU PPDU is mandatory for HE AP while Rx of HE MU PPDU is optional for HE AP. Similarly, Tx of HE TB PPDU is not applicable to HE AP. Hence blanket statements as in section 28.1.4 are inaccurate. The section 28.1.1 describes accurately the mandatory and optional PPDU formats.

**Resolution of CID 14013**

**TGax Editor: Please make the following changes to section 28.1.4 (CIDs: 14013)**

28.1.4 PPDU formats

The structure of the PPDU transmitted by an HE STA is determined by the TXVECTOR parameters as defined in Table 28-1 (TXVECTOR and RXVECTOR parameters).

The FORMAT parameter determines the overall structure of the PPDU and can take on one of the following values:

— Non-HT format (NON\_HT), based on Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification) and including non-HT duplicate format.

— HT-mixed format (HT\_MF) as specified in Clause 19 (High Throughput (HT) PHY specification).

— HT-greenfield format (HT\_GF) as specified in Clause 19 (High Throughput (HT) PHY specification).

— VHT format (VHT) as defined in Clause 21 (Very High Throughput (VHT) PHY specification).

— HE SU PPDU format (HE\_SU) carries a single PSDU. With this format the HE-SIG-A field is not

repeated. ~~Support for the HE SU PPDU format is mandatory.~~ (#14013)

— HE ER SU PPDU format (HE\_EXT\_SU) carries a single PSDU. It is similar to the HE SU PPDU

format, except that the HE-SIG-A field is repeated. ~~Support for the HE ER SU PPDU format is mandatory.~~ (#14013)

— HE MU PPDU format (HE\_MU) carries one or more PSDUs to one or more users. ~~Support for the~~

~~HE MU PPDU format is mandatory.~~ (#14013)

— HE TB PPDU format (HE\_TRIG) carries a single PSDU and is sent in response to a PPDU that carries a Trigger frame or a frame that contains a UMRS Control field. The preamble format prior to the HE-STF field is identical to the HE SU PPDU. ~~Support for the HE TB PPDU format is mandatory.~~ (#14013)

**References:**

1. **IEEE P802.11axTM/D2.0, Oct 2017.**