IEEE P802.11  
Wireless LANs

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| Comment Resolutions on PHY INTRODUCTION  Part 4 | | | | |
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Abstract

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

11903, 13874, 11905, 12667, 11906,

12063, 12420, 12421, 12423, 12424,

12555, 12556, 12616, 12617, 13542,

13543, 12658, 12669, 12675, 12676,

13336, 13337, 12755, 12814, 13102,

13335, 13544, 13627, 13875, 13876,

13877, 14212, 14225

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.***

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| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause Number** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 11903 | 9.4.2.237.3 | 141.6 | "LDPC Coding in Payload", LDPC is mandatory for >20MHz, and/or >4SS, need to add conditions with which LDPC is optional | Add conditions when this field is meaningful, i.e. when LDPC is optional. | Revised—  Agree with commeter. A note is added along the following lines.  A device that support >20 MHz and/or >4SS shall set this bit to 1.  Tgax Editor to make the changes for CID11903 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 13874 | 9.4.2.237.3 | 141.6 | "Indicates support for the transmission and reception of LDPC encoded packets." Which LDPC coding is supported? In 28.1.1, 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 supports transmitting and receiving HE SU PPDUs of bandwidths greater than 20 MHz An HE STA may support the following features: -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 Do you mean when the bandwidth is 20MHz or when the maximum number of spatial streams is less than or equal to 4? Or both? | Please clearly specify what is supported. For example, refer 10.16 LDPC operation. 10.16 is how to indicate the LDPC support. Please revise the 10.16 for 802.11ax. Also, update the PHY MIB variables in Annex C. Because the description parts of all HE PHY MIB variables are empty. | Revised—  Resolution of CID 11903 is applicable |
| 11905 | 9.4.2.237.2 | 143.35 | For "Triggered SU Beamforming Feedback" field, the interpretation does not mention anything related to Triggered feedback, same issue for MU and CQI in the next two rows. | Clarify these capabilities are for triggered feedbacks | Revised—  Agree with the commenter. 11ax has HE TB sounding sequence and non-TB sounding sequence. These fields are applicable for HE TB sounding sequence. Propose to improve the description of the fields to mention “HE TB Sounding Sequence” keyword  Tgax Editor to make the changes for CID12680 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 12667 | 9.4.2.237.2 | 143.35 | The descriptions of the Triggered SU/MU/CQI Beamforming Feedback" subfields are not clear in that they miss the key ingredient that the feedback is trigger-based | Add "trigger-based" after "indicates support for the" in the three rows referred to (6 changes in total) | Revised—  Resolution of CID11905 applies. |
| 11906 | 9.4.2.237.2 | 144.6 | "PPE Threshold Present"--if this field is 0, then does it mean all rates do NOT require PE? | Clarify | Revised—  Agree with commeter that description is missing.  Propose that for a device with PPE Threshold Present = 0; the PE duration = 0.  Tgax Editor to make the changes for CID11906 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 12063 | 9.4.2.237.3 | 143.00 | For 80+80MHz and 80x2MHz BW, sounding feedback for Ng=4 takes a lot of BW and therefore reduce the efficiency of the WLAN. Make Ng=4 grouping for 80+80MHz and 80x2MHz BW as optional instead of mandaotry. | Make Ng=4 sounding feedback for 80+80MHz and 80x2MHz BW as optional instead of mandaotry. Add one capability in Figure 9-589cl and Table 9-262aa to indicate Ng=4 support for 80+80 MHz and 160MHz BW. | Reject—  11ax allows two Ng (Tone Grouping Factor) values, 4 and 16.  Regardless of BW, support of Ng = 16 is optional at the HE Beamformee. Simulations have shown that Ng = 16 feedback cannot support satisfactory performance for MU-MIMO and hence Ng = 4 is mandated.  Making Ng = 4 optional for 160/80+80 MHz, implies there is no mandated tone grouping factor for 160/80+80 MHz sounding.  The HE CBF size for 160 MHz with Ng = 4 is similar to VHT CBF with Ng = 1.  Furthermore, if 160 MHz PPDU is used to transmit the CBF, the CBF PPDU is comparable in ‘duration’ than the lower BW sounding cases. |
| 12420 | 9.4.2.237.3 | 141.44 | Change to "For an AP, indicates support for the MU MIMO reception.." | As in comment | Reject—  The comment is unclear. The current text description of “Full Bandwidth UL MU-MIMO” capability:  “For an AP, indicates support for MU-MIMO reception of an HE TB PPDU on an RU that spans the entire PPDU bandwidth (UL MU-MIMO).  For a non-AP STA, indicates support for the transmission of an HE TB PPDU on an RU that spans the entire PPDU bandwidth (UL MU-MIMO).” |
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| 12423 | 9.4.2.237.3 | 144.15 | This subfield is set to 1 if the HE ER SU PPDU With 4x HE-LTF And 0.8 ++s GI subfield is 1.  Per this sentence, the two subfields can be combined to one subfield. Another issue is that this subfield is not used by other place in the draft. | Fixed the issue. | Reject—  HE ER SU PPDU is not tested as part of WFA 11ax wave-1. Hence, the HE ER SU PPDU is explicitly given a capability.  In regard to the use of “HE SU PPDU And HE MU PPDU With 4x HE-LTF And 0.8 s GI” this field is related to description in HE PHY Introduction (28.1.1). |
| 12424 | 9.4.2.237.3 | 144.34 | This subfield is not used by other place in the draft. | Fixed the issue. | Reject—  This field is used in HE PHY Introduction (Section 28.1.1) |
| 12555 | 9.4.2.237.3 | 144.45 | Field name "20 MHz In 160/80+80 MHz HE PPDU" can be improved | As in comment | Reject—  The commenter did not provide any suggestion.  Current field name is appropriate. |
| 12556 | 9.4.2.237.3 | 144.53 | Field name "80 MHz In 160/80+80 MHz HE PPDU" can be improved | As in comment | Reject—  The commenter did not provide any suggestion.  Current field name is appropriate. |
| 12616 | 9.4.2.237.2 | 141.60 | DCM Max NSS Tx/Rx should be reserved when DCM Max Constellation Tx/Rx indicates no DCM support | At the bottom of the rightmost cell of the DCM Max NSS Tx row add "Reserved if the DCM Max Constellation Tx subfield is 0". At the bottom of the rightmost cell of the DCM Max NSS Rx row add "Reserved if the DCM Max Constellation Rx subfield is 0". | Accept— |
| 12617 | 9.4.2.237.2 | 141.53 | "B0-B1" followed by a list containing "01" and "10" is confusing | Change the rightmost cell of the DCM Max Constellation Tx and DCM Max Constellation Rx rows to use a decimal rather than a binary before the colon | Revised—  Agree with commenter. The field with integer mapping is proposed.  Tgax Editor to make the changes for CID12627 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 13542 | 9.4.2.237.2 | 141.55 | Encoding description would be the form of decimal values not the bit order | Change the Encoding description as 'B0-B1 signals' to 'The values indicates' and bit setting part to 'Set to 0 for no DCM support, Set to 1 for upto BPSK, Set to 2 for upto QPSK, Set to 3 for upto 16QAM' | Revised—  Resolution of CID 12617 is applicable. |
| 13543 | 9.4.2.237.3 | 142.8 | Encoding description would be the form of decimal values not the bit order | Change the Encoding description as 'B0-B1 signals' to 'The values indicates' and bit setting part to 'Set to 0 for no DCM support, Set to 1 for upto BPSK, Set to 2 for upto QPSK, Set to 3 for upto 16QAM' | Revised—  Resolution of CID 12617 is applicable. |
| 12658 | 9.4.2.237.2 | 138.15 | There are DCM Max Constellation Rx and DCM Max NSS Tx/Rx capability fields, but no normative behaviour associated with them | Add normative behavioural requirements in Clause 27 (see other comment on "DCM Rx" field in Clause 27) | Reject—  Please refer to Section 27.15.3 in D2.2 |
| 12669 | 9.4.2.237.2 | 142.26 | "Set to 1 if supported or if sent by an AP with support for 4 or more spatial streams." is confusing as it suggests an AP with support for >= 4SS might set the field even if it does not support the feature | Change the cited text to "Set to 1 if supported. NOTE---Set to 1 by an AP with support for 4 or more spatial streams." Also add the NOTE to the MU Beamformer row | Revised—  Agree with the commenter. However, don’t need to add the note to MU Beamformer row since it refers to SU beamformer field itself.  Tgax Editor to make the changes for CID12669 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 12675 | 9.4.2.237.2 | 143.10 | "Reserved if the SU Beamformee field is 0." refers to the wrong fielf | Change "Beamformee" to "Beamformer" in the cited text | Accept— |
| 12676 | 9.4.2.237.2 | 143.17 | "Reserved if the SU Beamformee field is 0." refers to the wrong fielf | Change "Beamformee" to "Beamformer" in the cited text | Accept— |
| 13336 | 9.4.2.237.3 | 143.11 | Wrong reference | Change "SU Beamformee" to "SU Beamformer" | Revised—  Resolution of CID 12675 is applicable. |
| 13337 | 9.4.2.237.3 | 143.18 | Wrong reference | Change "SU Beamformee" to "SU Beamformer" | Revised—  Resolution of CID 12676 is applicable. |
| 12755 | 9.4.2.237.3 | 142.46 | N\_{STS,total} is not defined (2x in this table) | Define this as a NOTE in Table 9-262aa | Revised—  N\_{STS,Total} is not appropriate rather N\_(STS,RU,Total) is applicable here.  Tgax Editor to make the changes for CID12755 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 12814 | 9.4.2.237.3 | 144.53 | It's not just 160 MHz OFDMA | Change "160 MHz" to "160/80+80 MHz" at the referenced location | Reject—  160/80+80 MHz refers to HE PPDU bandwidth. In both cases, the field indicates 160 MHz OFDMA support |
| 13102 |  | 143.60 | In Table 9-262aa on Partial Bandwidth field, SU RU is not defined. | Add a NOTE in the Encoding column -A SU RU is the a single RU that occupies the entire transmission bandwidth | Reject—  The intent of existing NOTE in spec. is to ensure that a device that does not support DL OFDMA + DL MU-MIMO can still participate in the DL OFDMA+DL MU-MIMO transmission. Such a device is given an SU RU, i.e., an RU that may or may not span the entire PPDU bandwidth but has only one user assigned to it. |
| 13335 | 9.4.2.237.3 | 141.17 | The Note is not complete, since there are also restrictions to NSTS for DCM and STBC. Moreover, the wording 'reserved' suggests that this capability depends on PPDU type which is not the case. | Remove note or make it more generic. | Revised—  ‘Midamble Rx Max NSTS’ indicates maximum Nsts for reception of PPDUs with Midamble. This field is applicable to all PPDU types. Hence the NOTE specific to HE ER SU PPDU is not required.  Furthermore, HE-SIG-A of HE ER SU PPDU describes the information contained in the NOTE.  Tgax Editor to make the changes for CID13335 as suggested in proposed resolution in IEEE 802.11-18/0404r0 |
| 13544 | 9.4.2.237.3 | 141.55 | The capability for '20MHz In 40MHz HE PPDU in 2.4GHz' seems to make too many fragmented combination of 20MHz-only STA capabilities. In addition, if dual-band 20MHz-only STA is implemented, it is already in nature to support 26/52/106-tones for 40MHz PPDU from PHY perpsecitve. So, this bit could be redundant bit. In order to simplify 20MHz-only sTA options and AP's capability consideration. Make it reserved on this bit and retrieve the tone mapping capabliity of 26/52/106-tone in 2.4GHz as before. | Make it as reserved bit and change the tone mapping of 26/52/106-tone in 40MHz as mandatory accordingly. Note 242-tone RU in 40MHz would be still mandatory. | Reject—  Support of 40 MHz in 2.4 GHz band is optional. Hence, support of 26/52/106 RU in 40 MHz in 2.4 GHz for a 20 MHz-only device cannot be mandatory. Thus the capability is needed. |
| 13627 | 9.4.2.237.3 | 138.22 | B0,B1... are used as bit index for each subfield in following table 9-262aa. It's misleading to use B0-B71 in this figure. | Remove B0-B71 in this figure. Since each subfield has own bit indices, do not need a global bit index here. Alternative resolution is to use global bit indices in table 9-262aa. | Revised—  Table 9-262aa avoids using Bit convention wherever possible. The confusion may arise for ‘channel width set’ and ‘Punctured Preamble Rx’ fields.  Propose to remove the bit position mark deletion from the Figure 9-589cl (HE PHY Capabilities Information field format).  Tgax Editor to make the changes for CID13627 as suggested in proposed resolution in IEEE 802.11-18/0404r |
| 13875 | 9.4.2.237.3 | 141.36 | "For an AP, indicates support for MU-MIMO reception of an HE TB PPDU on an RU that spans the entire PPDU bandwidth (UL MU-MIMO)." The UL MU-MIMO is triggered from an AP. If the AP does not support a reception of the UL MU-MIMO, it does not send a trigger framne for the UL MU-MIMO. Indication that an AP supports a reception of the UL MU-MIMO is not necessary to a STA. | Remove the cited sentence. | Reject—  UL MU-MIMO over full bandwidth is optional feature and hence requires signalling. With respect to AP, the signalling is whether receive of UL MU-MIMO over full bandwidth is supported. The properties advertised by APs may be used in several ways by STAs, both associated and un-associated. |
| 13876 | 9.4.2.237.3 | 141.44 | "For an AP, indicates support for the reception of an HE TB PPDU on an RU that does not span the entire PPDU bandwidth (UL MU-MIMO with OFDMA)." The UL MU-MIMO with OFDMA is triggered from an AP. If the AP does not support a reception of the UL MU-MIMO with OFDMA, it does not send a trigger framne for the UL MU-MIMO with OFDMA. Indication that an AP supports a reception of the UL MU-MIMO with OFDMA is not necessary to a STA. | Remove the cited sentence. | Reject—  UL MU-MIMO over partial bandwidth (UL MU-MIMO + UL OFDMA) is optional feature and hence requires signalling. With respect to AP, the signalling is whether receive of UL MU-MIMO over partial bandwidth is supported. The properties advertised by APs may be used in several ways by STAs, both associated and un-associated. |
| 13877 | 9.4.2.237.3 | 143.52 | "Indicates support for the transmission and reception of the Data field of the HE ER SU PPDU when transmitted over the high frequency 106-tone RU within primary 20 MHz channel." Support both a transmission and a reception is not needed. Remove "transmission and". | Change as the following: "Indicates support for the reception of the Data field of the HE ER SU PPDU when transmitted over the high frequency 106-tone RU within primary 20 MHz channel." | Accept— |
| 14212 | 9.4.2.237.3 | 140.56 | The word "only" is missed before "the secondary 20MHz" | add "only" before "the secondary 20MHz". | Accept— |
| 14225 | 9.4.2.237.3 | 142.25 | The conditions if SU Beamformer is mandatory (pp142L25) and if MU Beamformer is mandatory(pp142L36, pp263L34, pp263L38) cross-refer and are not clear. | Restructure and clarify these conditions according to following structure: If Nss => 4 is supported, SU beamformer subfield and MU beamformer subfield shall be set to 1. If Nss < 4, and if SU beamformer is supported, SU beamformer subfield shall be set to 1. If Nss < 4, and if MU beamformer is supported, MU beamformer subfield and SU beamformer subfield shall be set to 1. | Reject—  An AP that supports MU beamformer function automatically supports SU beamformer function because the sounding protocol support is built-in this AP (If an AP can beamform with multiple users then it surely can beamform with a single user).  On the other hand, an AP that supports SU beamformer shall support MU beamformer function if it supports transmitting 4 or more spatial streams. (If an AP can beamform with a single user then only if it supports > 4 SS it can beamform with multiple users) |
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**Resolution for CID 11903,13874**

**TGax Editor: Please make the following changes to Table 9-262aa (CIDs: 13335,13874)**

**Table 9-262aa—Subfields of the HE PHY Capabilities Information field**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| LDPC Coding In Payload | Indicates support for the transmission and reception of LDPC encoded packets. | Set to 0 if not supported. Set to 1 if supported.  NOTE—Set to 1 by a STA that supports either more than 4 spatial streams or HE PPDU bandwidths greater than 20 MHz or HE-MCS 10 or HE-MCS 11. (#11903) |

**Resolution for CID 11905**

**TGax Editor: Please make the following changes to Table 9-262aa (CIDs: 11905)**

**Table 9-262aa—Subfields of the HE PHY Capabilities Information field**

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| **Subfield** | **Definition** | **Encoding** |
| Triggered SU Beamforming Feedback | For HE TB sounding sequence, ~~For an~~at the AP, indicates support for the reception of partial and full bandwidth SU-type feedback. (#11905)  For HE TB sounding sequence, ~~For a~~at the non-AP STA, indicates support for the transmission of partial and full bandwidth SU-type feedback. | Set to 0 if not supported. Set to 1 if supported. |
| Triggered MU Beamforming Feedback | For HE TB sounding sequence, ~~For an~~at the AP, indicates support for the reception of partial bandwidth MU-type feedback.  For HE TB sounding sequence, ~~For a~~at the non-AP STA, indicates support for the transmission of partial bandwidth MU-type feedback. | Set to 0 if not supported. Set to 1 if supported. |
| Triggered CQI Feedback | For HE TB sounding sequence,~~For an~~at the AP, indicates support for the reception of partial and full bandwidth CQI-only feedback.  For HE TB sounding sequence,~~For a~~at the non-AP STA, indicates support for the transmission of partial and full bandwidth CQI-only feedback. | Set to 0 if not supported. Set to 1 if supported. |

**Resolution for CID 11906**

**TGax Editor: Please make the following changes to section 27.12 (HE PPDU post FEC padding and packet extension)**

An HE STA with dot11PPEThresholdsRequired set to false may set the PPE Thresholds Present subfield in HE Capabilities elements that it transmits to 0.

An HE STA with dot11PPEThresholdsRequired set to true shall set the PPE Thresholds Present subfield in HE Capabilities elements that it transmits to 1.

A STA that sets the PPE Thresholds Present subfield in HE Capabilities elements that it transmits to 0 has zero packet extension duration value for constellations, NSS and RU allocations it supports.

A STA that sets the PPE Thresholds Present subfield in HE Capabilities elements that it transmits to 1 shall indicate its minimum post-FEC padding and packet extension duration value per constellation, NSS and RU allocation by setting the subfields of the PPE Thresholds field according to 9.4.2.237 (HE Capabilities element) and using the corresponding values from dot11PPEThresholdsMappingTable.

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**Resolution for CID 12617**

**TGax Editor: Please make the following changes to Table 9-262aa (CIDs: 12617)**

**Table 9-262aa—Subfields of the HE PHY Capabilities Information field**

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| **Subfield** | **Definition** | **Encoding** |
| DCM Max Constellation Tx | Indicates the maximum supported constellation for DCM in the Data field of an HE TB PPDU that the STA is capable of transmitting. | ~~B0-B1 signals the maximum constellation: 00: Does not support DCM 01: BPSK 10: QPSK 11: 16-QAM~~ (#12617)  **Set to 0 when DCM not supported.**  **Set to 1 for BPSK.**  **Set to 2 for QPSK.**  **Set to 3 for 16-QAM.** |
| DCM Max Constellation Rx | Indicates the maximum supported constellation for DCM in both the Data field and HE-SIG-B field that the STA is capable of receiving. | ~~B0-B1 signals the maximum constellation: 00: Does not support DCM 01: BPSK 10: QPSK 11: 16-QAM~~  **Set to 0 when DCM not supported.**  **Set to 1 for BPSK.**  **Set to 2 for QPSK.**  **Set to 3 for 16-QAM.** |

**Resolution for CID 12669**

**TGax Editor: Please make the following changes to Table 9-262aa (CIDs: 12669)**

**Table 9-262aa—Subfields of the HE PHY Capabilities Information field**

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| **Subfield** | **Definition** | **Encoding** |
| SU Beamformer | Indicates support for operation as an SU beamformer. | Set to 0 if not supported. Set to 1 if supported ~~or if sent by an AP with support for 4 or more spatial streams~~.  **NOTE—Set to 1 by an AP with support for 4 or more spatial streams. (#12669)** |

**Resolution for CID 12755**

**TGax Editor: Please make the following changes to Table 9-262aa (CIDs: 12755)**

**Table 9-262aa—Subfields of the HE PHY Capabilities Information field**

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| **Subfield** | **Definition** | **Encoding** |
| Beamformee STS <= 80 MHz | For bandwidth less than or equal to 80 MHz, it indicates the maximum number of space-time streams that the STA can receive in an HE NDP, the maximum value for total number of space-time streams over all the users in the *r*-th RU, *NSTS,r,total* (#12755) that can be sent in a DL MU-MIMO transmission on an RU where the RU may or may not span the entire PPDU bandwidth, that includes that STA. Reserved if the SU Beamformee field is 0. | If SU beamformee capable, set to the maximum number of spacetime streams that the STA is capable of receiving in an HE NDP minus 1. The minimum value of this field is 3. |
| Beamformee STS > 80 MHz | For bandwidths greater than 80 MHz, it indicates the maximum number of space-time streams that the STA can receive in an HE NDP, the maximum value for total number of space-time streams over all the users in the *r*-th RU, *NSTS,r,total* (#12755) that can be sent in a DL MU-MIMO trans-mission on an RU where the RU may or may not span the entire PPDU bandwidth, that includes that STA. Reserved if the SU Beamformee field is 0. | If SU beamformee capable, set to the maximum number of spacetime streams that the STA is capable of receiving in an HE NDP minus 1. The minimum value of this field is 3. |

**Resolution for CID 13335**

**TGax Editor: Please make the following changes to Table 9-262aa (CIDs: 13335)**

**Table 9-262aa—Subfields of the HE PHY Capabilities Information field**

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| **Subfield** | **Definition** | **Encoding** |
| Midamble Rx Max NSTS | When the Doppler Rx subfield is 1, indicates the maximum number of space-time streams supported for reception when midamble is used in the Data field. | Set to 0 for 1 space-time stream Set to 1 for 2 space-time streams Set to 2 for 3 space-time streams Set to 3 for 4 space-time streams  ~~NOTE—for an HE ER SU PPDU the values 2 and 3 are reserved.~~(#13335) |

**Resolution for CID 13627**

**TGax Editor: In Figure 9-589cl (HE PHY Capabilities Information field format), remove markings such as B0---B71 on the top of the fields.**

**References:**

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