IEEE P802.11
Wireless LANs

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| Proposed changes for some bug fixes and clarifications  |
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Abstract

This submission proposes changes to TGax D4.0 that fix bugs in the draft. The changes are not related to any CIDs.

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Included suggestions received during the presentation. Minor fixes.

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.***

### Clarification Fix 1: Maximum MPDU Length field inconsistency in 6 GHz Band Capabilities element.

***Discussion Item:*** *The Maximum MPDU Length field in the VHT Capabilities element is 2 bits. However, in Figure 9-772ai, where we show the size of the field it is listed as 3 bits, even though we inherit the same field from the VHT Capabilites element. Proposed change fixes the length inconsistency of the field and have the extra bit as reserved.*

* HE 6 GHz Band Capabilities element

**TGax Editor: *Change the figure below as follows (#BF1):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0       B2 | B3      B5 | B6         B7 | B8 | B9      B10 | B11 | B12 | B13 | B14   B15 |
|  | Minimum MPDU Start Spacing | Maximim A-MPDU Length Exponent | Maximum MPDU Length | Reserved | SM Power Save | RD Responder | Rx Antenna Pattern Consistency | Tx Antenna Pattern Consistency | Reserved |
| Bits: | 3 | 3 | 2 | 1*(#BF1)* | 2 | 1 | 1 | 1 | 2 |
| * Capabilities Information field
 |

### Clarification Fix 2: Inconsistencies for 6 GHz STAs

***Discussion Items:***

* *Spec mentions in several places “5 GHz and 6 GHz band” which can be mislead the reader to think that is applies to STAs that operate in both bands. Correct conjuction is “or”. Proposal is to make this change throughout the draft.*
* *According to 26.7.2 a STA cannot send HT Capabilities, VHT Capabilities, HT Operation and VHT Operation elements in the 6 GHz band. However, clause 9 still mentions that these elements are present if dot11HT/VHTOptionImplemented are true, which is inconsistent with the normative behavior. Proposal is to specify that these elements are present only if the STA is not a 6 GHz STA.*
* *Sentence “A STA operating in the 6 GHz band that sets dot11HE­OptionImplemented to true shall set both dot11VHTOptionImplemented and dot11HighThrough­putOptionImplemented to false.”, which was removed as part of comment resolution for CID 20456 appears in D4.3 and conflicts with the preceding sentence “A STA operating in the 5 GHz and 6 GHz band that sets dot11HEOptionImplemented to true shall set both dot11VHTOptionImplemented and dot11HighThroughputOptionImplemented to true.”. Proposal is to instruct the editor to remove the sentence from D4.3.*
* Beacon frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Beacon frame body
 |
| Order | Information | Notes |
| 33 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 34 | HT Operation | The HT Operation element is included by an AP and a mesh STA when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 56 | VHT Capabilities | The VHT Capabilities element is present when dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 57 | VHT Operation | The VHT Operation element is present when dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*; otherwise, it is not present. |

* Association Request frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Association Request frame body
 |
| Order | Information | Notes |
| 13 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 22 | VHT Capabilities | The VHT Capabilities element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |

* Association Response frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Association Response frame body
 |
| Order | Information | Notes |
| 14 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 15 | HT Operation | The HT Operation element is included by an AP when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 27 | VHT Capabilities | The VHT Capabilities element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 28 | VHT Operation | The VHT Operation element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*; otherwise, it is not present. |

* Reassociation Request frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Reassociation Request frame body
 |
| Order | Information | Notes |
| 16 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 27 | VHT Capabilities | The VHT Capabilities element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |

* Reassociation Response frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Reassociation Response frame body
 |
| Order | Information | Notes |
| 16 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 17 | HT Operation | The HT Operation element is included by an AP when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 31 | VHT Capabilities | The VHT Capabilities element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 32 | VHT Operation | The VHT Operation element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*; otherwise, it is not present. |

* Probe Request frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Probe Request frame body
 |
| Order | Information | Notes |
| 7 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 17 | VHT Capabilities | The VHT Capabilities element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |

* Probe Response frame format

**TGax Editor: *Change the rows below of the table as follows (#BF2):***

|  |
| --- |
| * Probe Response frame body
 |
| Order | **Information** | **Notes** |
| 31 | HT Capabilities | The HT Capabilities element is present when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 32 | HT Operation | The HT Operation element is included by an AP and a mesh STA when dot11HighThroughputOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 58 | VHT Capabilities | The VHT Capabilities element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*. |
| 59 | VHT Operation | The VHT Operation element is present when (#172)dot11VHTOptionImplemented is true and the STA is not a 6 GHz STA*(#BF2)*; otherwise, it is not present. |

**26.17.1 Basic HE BSS operation**

**TGax Editor: *Change the paragraphs below as follows (#BF2):***

A STA operating in the 2.4 GHz band that sets dot11HEOptionImplemented to true shall set dot11HighThroughputOptionImplemented to true. A STA operating in the 5 GHz or 6 GHz band that sets dot11HEOptionImplemented to true shall set both dot11VHTOptionImplemented and dot11HighThroughputOptionImplemented to true. A non-AP STA that sets dot11HEOptionImplemented to true shall set dot11MultiBSSIDImplemented to true.*(#BF2)*

An HE STA follows the rules in 11.40 (VHT BSS operation) for channel selection, determining scan­ning requirements, channel switching, NAV assertion and antenna indication when operating in the 5 GHz or 6 GHz band unless explicitly stated otherwise in Clause 26. An HE STA shall additionally fol­low the rules in 26.17.2 (HE BSS operation in the 6 GHz band) for scanning and operation in the 6 GHz band.*(#BF2)*

9.4.2.36 Neighbor Report element

**TGax Editor: *Change the paragraph below as follows (#BF2):***

NOTE 1—This subfield indicates that the reported AP is part of an ESS that has no 6 GHz-only APs that might be detected by a STA receiving this frame. This means that all APs operating in the 6 GHz band that are part of that ESS that might be detected by a STA receiving this frame can be discovered in the 2.4 GHz and/or 5 GHz bands.*(#BF2)*

9.4.2.170 Reduced Neighbor Report element

**TGax Editor: *Change the paragraph below as follows (#BF2):***

NOTE 1—This subfield indicates that the reported AP is part of an ESS that has no 6 GHz-only APs that might be detected by a STA receiving this frame. This means that all APs operating in the 6 GHz band that are part of that ESS that might be detected by a STA receiving this frame can be discovered in the 2.4 GHz and/or 5 GHz bands.*(#BF2)*

10.13.2 A-MPDU length limit rules

**TGax Editor: *Change the paragraph below as follows (#BF2):***

Using the Maximum A-MPDU Length Exponent fields in the HT Capabilities, ~~and~~ VHT Capabilities, HE Capabilities and HE 6 GHz Band Capabilities elements (if present), the STA establishes at association the maximum length of an A-MPDU pre-EOF padding that can be sent to it. An HT STA shall be capable of receiving A-MPDUs of length up to the value indicated by the Maximum A-MPDU Length Expo­nent field in its HT Capabilities element. A VHT STA shall be capable of receiving A-MPDUs where the A-MPDU pre-EOF padding length is up to the value indicated by the Maximum A-MPDU Length Exponent field in its VHT Capabilities element. An HE STA shall be capable of receiving A-MPDUs where the A-MPDU pre-EOF padding length is up to the value indicated by the Maximum A-MPDU Length Exponent field in its HT Capabilities and VHT Capabilities elements, and the Maximum A-MPDU Length Exponent Extension field in its HE Capabilities element in the 2.4 GHz or 5 GHz band. An HE STA shall be capable of receiving A-MPDUs where the A-MPDU pre-EOF padding length is up to the value indicated by the Maximum A-MPDU Length Exponent Extension field in the HE Capabilities element and the Maximum A-MPDU Length Exponent field in HE 6 GHz Band Capabilities element in the 6 GHz band.*(#BF2)*

A STA shall not transmit an A-MPDU in an HT PPDU that is longer than the value indicated by the Maximum A-MPDU Length Exponent field in the HT Capabilities element received from the intended receiver. MPDUs in an A-MPDU carried in an HT PPDU shall be limited to a maximum length of 4095 octets. A STA shall not transmit an A-MPDU in a VHT PPDU where the A-MPDU pre-EOF padding length is longer than the value indicated by the Maximum A-MPDU Length Exponent field in the VHT Capabilities element received from the intended receiver. A DMG STA shall not transmit an A-MPDU that is longer than the value indicated by the Maximum A-MPDU Length Exponent field in the DMG Capabilities element received from the intended receiver. A STA shall not transmit an A-MPDU in an HE PPDU where the A-MPDU pre-EOF padding length is greater than the value indicated by the Maximum A-MPDU Length Exponent field in the HT Capabilities and VHT Capabilities elements, and the Maximum A-MPDU Length Exponent Extension field in its HE Capabilities elements received from the intended receiver in the 2.4 GHz or 5 GHz band. A STA shall not transmit an A-MPDU in an HE PPDU where the A-MPDU pre-EOF padding length is greater than the value indicated by the Maximum A-MPDU Length Exponent Extension field in the HE Capabilities element and the Maximum A-MPDU Length Exponent field in the HE 6 GHz Band Capabilities ele­ment received from the intended receiver in the 6 GHz band.*(#BF2)*

**26.17.2.4 Out of band discovery of a 6 GHz BSS**

**TGax Editor: *Change the paragraph below as follows (#BF2):***

NOTE—This subfield indicates that the reported AP is part of an ESS that has no 6 GHz-only APs that might be detected by a STA receiving this frame. This means that all APs operating in the 6 GHz band that are part of that ESS that might be detected by a STA receiving this frame can be discovered in the 2.4 GHz and/or 5 GHz bands.*(#BF2)*

### Clarification Fix 3: Update definition of non-HT to exclude HE.

***Discussion Item:*** *Definition of non-HT means neither HT nor VHT. But it must also include nor HE as well.*

**3.2 Definitions specific to IEEE Std 802.11**

**TGax Editor: *Change the paragraph below of this subclause as follows (#BF3):***

**non-high-throughput (non-HT)**: A modifier meaning neither high throughput (HT) nor very high throughput (VHT) nor high efficiency (HE).*(#BF3)*

### Clarification Fix 4: Update protection rules for VHT STAs to also include HE STAs.

***Discussion Item:*** *Subclause 10.28.5 (Protection rules for VHT STAs) need to be updated to also include HE STAs as well. This is because HE STAs operating in the 2.4 GHz are not VHT STAs but are HT STAs, hence the rules would apply to HE STAs as well. Proposed change fixes this by adding a paragraph to the subclause to cover HE STAs.*

**TGax Editor: *Insert a new paragraph at the end of the subclause and change the heading as follows (#BF4):***

**10.28.5 Protection rules for VHT STAs and HE STAs***(#BF4)*

A VHT STA is subject to all of the rules for HT STAs that apply to its operating band, except that a PPDU with the TXECTOR FORMAT parameter set to VHT may be substituted for a PPDU with the TXVECTOR FORMAT parameter set to HT\_MF.

An HE STA is subject to all of the rules for HT STAs that apply to its operating band, except that a PPDU with the TXECTOR FORMAT parameter set to HE may be substituted for a PPDU with the TXVECTOR FORMAT parameter set to HT\_MF.*(#BF4)*

### Clarification Fix 5: UL 2x996-tone RU Support dependency on UL MU MIMO and 160 MHz Support

***Discussion Item:*** *UL 2x996-tone RU Support indicates if the STA support the reception of a TRS Control field or Trigger frame with RU Allocation indicating 2x996-tone RU. A STA that declares support for full BW UL MU MIMO and supports 160 MHz channel needs to set this bit to 1 so that the STA can be triggered for UL MU MIMO in the 160 MHz channelwidth.*

**26.5.2.1 General**

**TGax Editor: *Change the paragraph below as follows (#BF5):***

A non-AP HE STA shall set the UL 2×996-tone RU Support subfield in HE Capabilities element to 1 if it supports receiving a frame that carries a TRS Control subfield that allocates a 2×996-tone RU or a Trigger frame with User Info field addressed to the STA with RU Allocation subfield indicating a 2×996-tone RU. The STA shall set the UL 2x996-tone RU Support subfield to 1 if the transmitted HE Capabilities element has the Full Bandwidth UL MU-MIMO subfield equal to 1 and the Supported Channel Width Set indicating support for 160 MHz channel.*(#BF5)*

A non-AP HE STA with dot11ULMUMIMOOptionImplemented equal to true shall set the Full Bandwidth UL MU-MIMO subfield of the HE PHY Capabilities Information field of the HE Capabilities element it transmits to 1, if it supports transmitting an HE TB PPDU that uses UL MU-MIMO within an RU that spans the entire PPDU bandwidth. Otherwise, the HE STA shall set the Full Bandwidth UL MU-MIMO subfield to 0.

### Clarification Fix 6: Transmission of GCR MU BAR Trigger frames

***Discussion Item:*** *An AP sends a GCR MU BAR Trigger frame to one or more STAs with a MAC address that is a group address. The current rule is generic and indicates that this Trigger frame variant is sent to one or more HE STAs from the GCR ba session. However, it does not clearly indicate whether the STAs are in the awake state or not so that they can respond to the GCR MU BAR. Propose to clarify that the STAs are in the awake state.*

**10.26.9.4 GCR block ack BlockAckReq and BlockAck frame exchanges**

**TGax Editor: *Change the paragraph below as follows (#BF6):***

~~When~~ If the retransmission policy for a group address is GCR Block Ack, an originator shall not transmit more than the GCR buffer size number of A-MSDUs with RA field set to the GCR concealment address and the DA field of the A-MSDU subframe set to the GCR group address before sending a BlockAckReq frame to one of the STAs that has a GCR block ack agreement for this group address. The RA field of the Block­AckReq frame shall be set to the MAC address of the destination STA. Upon reception of the BlockAck frame, an originator may send a BlockAckReq frame to another STA that has a block ack agreement for this group address, and this process may be repeated multiple times. If the originator has a GCR block ack agree­ment with one or more of the HE STAs for this group address, the originator may send a GCR MU-BAR Trigger frame to one or more of the HE STAs that are in the awake state.*(#BF6)* Upon reception of the BlockAck frame from one or more HE STAs, the originator may send a GCR MU-BAR Trigger frame to one or more other HE STAs that have a GCR block ack agreement, and this process may be repeated multiple times.

### Clarification Fix 7: Minor inconsistencies in dynamic fragmentation

***Discussion Item:*** *Language for level 2 and level 3 fragmentation is ambiguous as it refers to the blockacknowledgment record for a received fragment. However, the blockack record is for gthe MSDU or A-MSDU for which fragments are received. Propose to fix the language so that this is clear in the draft.*

**26.3.3.3 Level 2 dynamic defragmentation**

**TGax Editor: *Change the paragraph below as follows (#BF7):***

The STA shall update the corresponding block acknowledgment record for an MSDU or A-MSDU for which fragments are received only if that MSDU or A-MSDU *(#BF7)*is successfully reconstructed (see 10.6 (Defragmentation)). Otherwise the STA shall not update the block ack record for that MSDU or A-MSDU.

**26.3.3.4 Level 3 dynamic defragmentation**

**TGax Editor: *Change the paragraph below as follows (#BF7):***

The STA shall update the corresponding block acknowledgment record for an MSDU or A-MSDU for which fragments are received only if that MSDU or A-MSDU *(#BF7)*is successfully reconstructed (see 10.5 (MSDU and MMPDU defragmentation)). Otherwise the STA shall not update the block ack record for that MSDU or A-MSDU.

### Clarification Fix 8: TID Aggregation Limit and end of TXOP

***Discussion Item:*** *An AP sending a Basic Trigger frame is required to ensure that the solicited HE TB PPDUs and expected immediate responses are within the TXOP. The TID Aggregation Limit field in the Basic Trigger frame controls the MPDUs for which the STA sending the HE TB PPDU can solicit immediate responses. For the HE TB PPDU not to solicit an immediate response for the last HE TB PPDU of the TXOP the AP needs to set the TID Aggregation Limit to 0.*

**26.5.2.2.4 Allowed settings of the Trigger frame fields and TRS Control subfield**

**TGax Editor: *Insert a new paragraph below as follows (#BF8):***

An AP should set the TID Aggregation Limit subfield in the User Info fields of a Basic Trigger frame to 0 if the CS Required subfield in the Common Info field of the Basic Trigger frame is 0.

An AP shall set the TID Aggregation Limit subfield in the User info fields of a Basic Trigger frame to 0 if the solicited HE TB PPDU is the last PPDU of the TXOP.

NOTE—An HE TB PPDU is the last PPDU if the Duration/ID field is equal to 0 in the MPDU(s) contained in the HE TB PPDU.*(#BF8)*

### Clarification Fix 9: Unsolicited Probe Responses in non-HT duplicate PPDU

***Discussion Item:*** *Current spec specifies that both Beacon frames and FILS Discovery frames can be sent in non-HT duplicate mode. However, this is not specified for unsolicited Probe Responses, which is another option for passive scanning the 6 GHz band. Proposal is to clarify that unsolicited Probe Responses can also be sent in non-HT duplicate PPDU.*

**26.17.2.3.2 AP behavior for fast passive scanning**

An AP operating in the 6 GHz band may send an unsolicited Probe Response frame using the broadcast address, and shall follow the rules in 11.1.3.8 (Multiple BSSID procedure) if dot11MultiBSSIDImple­mented is true. The Probe Response frame shall be transmitted at a mandatory PHY rate and may be included in the broadcast RU of a DL HE MU PPDU provided the broadcast RU size does not exceed 106 subcarriers, is located within the primary 20 MHz channel and complies with the rules in 26.5.1.3 (RU allocation in an HE MU PPDU) and 27.3.2.8 (RU restrictions for 20 MHz operation). The Probe Response may be carried in a non-HT duplicate PPDU in which case the PPDU shall have the TXVECTOR parameter CH\_BANDWIDTH set to a value that is up to the operating channel width of the BSS.*(#BF9)*

### Clarification Fix 10: CH\_BANDWIDTH setting for HE TB PPDUs

***Discussion Item:*** *The CH\_BANDWIDTH in an HE TB PPDU assumes only 5 values (CBW20, CBW40, CBW80, CBW80+80, and CBW160). However, the CH\_BANDWIDTH of HE MU PPDU has more values (additional puncturing modes) and the CH\_BANDWIDTH of HE ER SU PPDU assumes 2 values ER RU 242 and ER RU 106, which do not match with any of those for an HE TB PPDU. Proposal is to add a note that only 5 of the above values are permissible when the soliciting PPDU is an HE SU PPDU or HE MU PPDU, and that only the CBW20 is permissible if the soliciting PPDU is an HE ER SU PPDU.*

**26.5.2.3.4 TXVECTOR parameters for HE TB PPDU response to TRS Control subfield**

A non-AP STA transmitting an HE TB PPDU in response to a frame containing a TRS Control subfield shall set the TXVECTOR parameters as follows:

* …
* The CH\_BANDWITDTH parameter is set to the value of the RXVECTOR parameter CH\_BAND­WIDTH of the soliciting DL HE PPDU (see Table 27-1 (TXVECTOR and RXVECTOR parame­ters))(#20324)
* …

NOTE 1—A non-AP STA transmitting an HE TB PPDU in response to a frame carrying a TRS Control subfield consid­ers both physical CS and virtual CS to be 0 (see 26.5.2.5 (UL MU CS mechanism)).

NOTE 2—The only permissible values for CH\_BANDWIDTH are CBW20, CBW40, CBW80, CBW80+80, and CBW160 if the soliciting PPDU is an HE SU PPDU or HE MU PPDU. The only permissible value for CH\_BANDWIDTH is CBW20 if the soliciting PPDU is an HE ER SU PPDU.*(#BF10)*