IEEE P802.11
Wireless LANs

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| LB233 CR 27.15.2 and 27.15.3  |
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Abstract

This submission proposes resolutions of comments received from TGax LB233.

(The proposed change is based on TGax Draft 3.0.)

* CIDs: 16080, 15119, 16685, 16458, 16126, 16140, 16141, 15799, 16598, 17023, 16687, 16688, 16143, 16689 (14 CIDs)

NOTE- 11-18/1181r4 proposed the same resolutions for CID 15799, 16598, 17023. If 11-18/1181r4 document will be motioned in November meeting, CID 15799, 16598, 17023 will be removed from this 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** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| --- | --- | --- | --- | --- | --- |
| 16080 | 364.55 | 27.15.2 | "An HE STA may transmit a 242-tone HE ER SU PPDU to a non-AP HE STA unless the most recentlyreceived OM Control field from that non-AP HE STA has the ER SU Disable subfield equal to 1. An HESTA shall not transmit a 242-tone HE ER SU PPDU to a STA if the most recently received OM Control sub-field from that STA has the ER SU Disable subfield equal to 1." -- duplication | Delete the first of the two cited sentences at the referenced location | Revised- The first sentence is saying that a 242-tone HE ER SU PPDU can be sent to to an HE STA. The second sentence is saying a 242-tone HE ER SU PPDU can’t be sent to an HE STA with some condition. Both sentences are needed. But, the wording should be simplified.TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 15119 | 364.61 | 27.15.2 | Both sentences are essentially saying the same thing. Delete the sentence with a 'may' and keep the sentence with a 'shall not'. | As in comment | Revised- The first sentence is saying that a 242-tone HE ER SU PPDU can be sent to to an HE STA. The second sentence is saying a 242-tone HE ER SU PPDU can’t be sent to an HE STA with some condition. Both sentences are needed. But, the wording should be simplified.TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 16685 | 364.61 | 27.15.2 | The ER SU disable feature is not well defined. There are requirements for a non-AP STA setting the OM Control field and there are reqirements for the AP setting the HE Operation element, but there are no requirements for a non-AP STA setting the HE Operation element (e.g., for TDLS) or for the AP setting the OM Control field (e.g., making it consistent with HE Operation element). The current statements are also cumbersome ("may... unless" rather than "shall not... unless"). | Fix this mess. Better yet convert ER SU Disable to a capability, which is what it really is. | Revised- If the OM Control field is transmitted by an HE AP, then the ER SU Disable subfield is reserved.The proposed rule has been implemented in the resolution of CID 16602.So, TGax editor needs no more changes for this CID.  |
| **27.15.2 PPDU format selection** ***TGax Editor: Change 3rd and 4th paragraphs of the subclause 27.15.2 as follows:*** An HE STA that transmits non-HT, HT, or VHT PPDUs shall follow the rules defined in 10.7 (Multirate support). An HE STA may transmit an HE SU PPDU to a peer HE STA. An HE AP may transmit an HE MU PPDU as defined in 27.5.1 (HE DL MU operation). A non-AP HE STA transmits HE TB PPDUs as defined in 27.5.3 (UL MU operation). An HE STA may transmit a 242-tone HE ER SU PPDU to a non-AP HE STA unless the most recently received OM Control field from that non-AP HE STA has the ER SU Disable subfield equal to 1 in which case the~~. An~~ HE STA shall not transmit a 242-tone HE ER SU PPDU to ~~a~~ that non-AP HE STA ~~if the most recently received OM Control sub-field from that STA has the ER SU Disable subfield equal to 1~~. A non-AP HE STA may transmit a 242-tone HE ER SU PPDU to an HE AP unless the most recently received HE Operation element from that AP has the ER SU Disable subfield equal to 1 in which case the~~. A~~ non-AP HE STA shall not transmit a 242-tone HE ER SU PPDU to ~~an~~ that AP if the most recently received HE Operation element from the AP has the ER SU Disable subfield equal to 1. |
| 16458 | 365.04 | 27.15.3 | It's not clear which rules from Clause 10.7 apply to HE STAs in the staement "follow the rules defined in 10.7". Note that this appears to be a problem everywhere that adopts cluase 9, 10, and 11 rules by reference. | For all HE MAC speciification sub-clauses that refer to clause 9-11 by reference, either specify exactly which requirements in the coross-referenced clauses apply or merge the subclause back into Clause 9-11. For instance, does the HE STA follow DMG requirements? (likely no) Does it follow any VHT requirements (likely yes)? Are there requirements that do not apply? | Rejected- In 4.3.14a (High efficiency (HE) STA), An HE STA is a VHT STA when it operates in the 5 to 7.125 GHz bands. Also, an HE STA is an HT STA when it operates in the 2.4 GHz band. In the 5GHz band, an HE STA follows the VHT requirement. And, in the 2.4 GHz band, an HE STA follows the HT requirement.  |
| 16126 | 365.11 | 27.15.2 | "if the PPDU is sent to a single TDLS STA" -- a non-AP STA can't send a PPDU to multiple TDLS STAs | Delete "single" in the cited text at the referenced location | Accepted |
| 16140 | 365.15 | 27.15.2 | "An HE STA shall not transmit an HE MU PPDU with an RU occupying the entire PPDU bandwidth and acompressed HE-SIG-B to a peer STA unless the HE STA has received from the peer STA an HE Capabili-ties element with the Rx Full BW SU Using HE MU PPDU With Compressed SIGB subfield in the HE PHYCapabilities Information field equal to 1." appears to allow a non-AP STA to refuse to support full-bw DL MU-MIMO | In the cited text change "a peer STA" to "an AP" and "the peer STA" to "the AP" | Revised-See the discussion of CID 15897 in 11-18/1459r3. However, the text descriptions requires qualification that the capability is only for DL MU PPDU sent to a single user.TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 16141 | 365.21 | 27.15.2 | "An HE STA shall not transmit an HE MU PPDU with an RU occupying the entire PPDU bandwidth and anon-compressed HE-SIG-B to a peer STA unless the PPDU bandwidth is less than or equal to 80 MHz andthe HE STA has received from the peer STA an HE Capabilities element with the Rx Full BW SU Using HEMU PPDU With Non-Compressed SIGB subfield in the HE PHY Capabilities Information field equal to 1." appears to allow a non-AP STA to refuse to support full-bw DL OFDMA | In the cited text change "a peer STA" to "an AP" and "the peer STA" to "the AP" | Revised-See the discussion of CID 15897 in 11-18/1459r3. However, the text descriptions requires qualification that the capability is only for DL MU PPDU sent to a single user. The proposed change is same as the 11-18/1459r3 approved in Sep 2018.TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| **27.15.2 PPDU format selection** ***TGax Editor: Change 8th and 9th paragraphs of the subclause 27.15.2 as follows:*** An HE STA shall not transmit an HE MU PPDU with a single user being allocated an RU occupying the entire PPDU bandwidth and a compressed HE-SIG-B to a peer STA unless the HE STA has received from the peer STA an HE Capabilities element with the Rx Full BW SU Using HE MU PPDU With Compressed SIGB subfield in the HE PHY Capabilities Information field equal to 1. An HE STA shall not transmit an HE MU PPDU with a single user being allocated an RU occupying the entire PPDU bandwidth and a non-compressed HE-SIG-B to a peer STA unless the PPDU bandwidth is less than or equal to 80 MHz and the HE STA has received from the peer STA an HE Capabilities element with the Rx Full BW SU Using HE MU PPDU With Non-Compressed SIGB subfield in the HE PHY Capabilities Information field equal to 1. |
| 15799 | 365.00 | 27.15.2 | an FTM frame used for FTM measurement cannot use HE format as legacy STAs will become non standard compliant. There is no need for special handling of ACK frames used for FTM as part of HE more than already existing in 802.11-2016. | Proposed change is to remove the special handing of ACK frame of FTM: "An Ack frame sent as a response to an HE ER SU PPDU or HE SU PPDU containing an FTM frame shall be sent in the same PPDU format as the soliciting PPDU except when the FTM frame is carried in HE SU PPDU and the most recent successfully received PPDU sent by the responding STA to the soliciting STA after association was an HE ER SU PPDU in which case the Control frame shall be carried in HE ER SU PPDU." | Revised- Agree in principle with the commenter. Handing of response to VHT FTM is may be carried in a VHT PPDU ACK to allow for same BW as the eliciting FTM frame, otherwise the accuracy of FTM is suvirely hindered.  When a control response frame of the FTM frame using 40MHz/80MH/160MHz/80+80MHz bandwidth is sent in the non-HT duplicate PPDU, the ToA measurement of the control response frame should be based on the 20MHz because a vendor specific phase change can be occurred over each 20MHz channels. In such case, the gain of using the wideband FTM measurement is lost. It is recommended to use an HT or VHT PPDU in the PPDU format of the control response frame. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 16598 | 365.43 | 27.15.2 | For the sentence from line 43 to 48, it does not make sense to design FTM response rule in 11ax since we already have a separate 11az group dealing with ranging algorithm. The sentence also suggests that we will have FTM in HE format, which will have the following issues. 1. It is not backward compatible with REVmc STAs (something which is contradicting to the TGaz PAR and CSD)Essentially it will create no2. The longer symbol time of HE format is expected to increase medium usage, which is already a problem of REVmc FTM, 11az mitigate this by using NDP with shorter symbol time from data HE PPDU. REVmc FTM uses long management frames for sounding purposes.3. There is no (range accuracy) performance advantage of using HE format (because REVmc FTM already supports all BWs),the performance is expected to somewhat degrade due to larger number of guard SC.4. Developing a new FTM mode in 11ax is clearly conflicting to the 11ax and 11az charters - the work is already well in progress in 11az.The WG can decide to modify the 11ax PAR to include FTM, however till then, 11az should allow to continue its work without interference from other TG.5. Developing an 11ax variant of FTM will create market confusion because 11az STAs are developing the HE support for FTM already well in progress. | Remove the cited sentence in 11ax draft. Bring the discussion to 11az group to make sure that HE design can be harmonized without conflicting with 11az design. | Revised –Agree in principle with the commenter. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 17023 | 365.43 | 27.15.2 | "An Ack frame sent as a response to an HE ER SU PPDU or HE SU PPDU containing an FTM frame shall be sent in the same PPDU format as the soliciting PPDU except when the FTM frame is carried in HE SU PPDU and the most recent successfully received PPDU sent by the responding STA to the soliciting STA after association was an HE ER SU PPDU in which case the Control frame shall be carried in HE ER SU PPDU."The spec stated the following:"The responding STA shall not use an HE format if the STA indicated VHT or HT-mixed or non-HT format in the initial Fine Timing Measurement frame."Because Table 9-272 (Format And Bandwidth field) does not have the HE PPDU, the HE PPDU can't be used by Fine Timing Measurement frames in an FTM session. | Please remove the cited sentence. | Revised –Agree in principle with the commenter. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| **27.15.2 PPDU format selection** ***TGax Editor: Change 10th paragraph of the subclause 27.15.2 as follows:*** An HE STA shall send Control frames following the rules defined in 10.7.6 (Rate selection for Control frames)) with the following exceptions:* … (18/12r3)
* ~~An Ack frame sent as a response to an HE ER SU PPDU or HE SU PPDU containing an FTM frame shall be sent in the same PPDU format as the soliciting PPDU except when the FTM frame is carried in HE SU PPDU and the most recent successfully received PPDU sent by the responding STA to the soliciting STA after association was an HE ER SU PPDU in which case the Control frame shall be carried in HE ER SU PPDU~~ An HE STA should send an Ack frame in the same PPDU format as the soliciting PPDU when the soliciting PPDU is a VHT PPDU or HT PPDU containing an FTM frame (#15799, 16598, 17023).
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| 16687 | 366.16 | 27.15.3 | This needs to be two separate statements because 6 Mb/s is not an MCS (it's a rate) and is implicitly 1 SS. | Change to "- A Control frame carried in an HE ER SU PPDU that is a response to a frame received in an HE ER SU PPDU shall use the <HE-MCS, NSS> tuple <MCS0, 1>. - A Control frame carried in a non-HT PPDU that is a response to a frame received in an HE ER SU PPDU shall use rate 6 Mb/s." | Revised- Agree in principle. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 16688 | 366.16 | 27.15.3 | This statement is unecessary. There could be a large power assymmetry between an AP and a non-AP STA (e.g., AP has 23 dBm output power and non-AP STA has 0 dBm output power), with the rsult that the AP could use a much higher MCS than MCS0 in response to an HE ER SU PPDU. The rate selection should be up to the recipient. We can have some consistency requirements so that the initiator can learn the rate over time. | Change the title of this subclause to "HE multirate support". Remove this bullet and add rules in subsequent paragraphs that for control frame responses to accommodate large power assymetries. In particular, allow response MCS to be higher than received MCS. Allow non-HT PPDU in response to HE ER SU PPDU. The rules would be something like the MCS can be less than or equal to the MCS used for data in the return parth. | Revised- Agree in principle. The PPDU format, DCM, 106-tone RU selection rules of the control response frame are changed to the recommendation. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| 16689 | 367.28 | 27.15.3 | This statement is incompatible with the statement at P365L50. It also does not account for the capabilities of the receiver. | Remove statement. Add more general rules that leave MCS, NSS and DCM selection for control responses up to the responder. | Revised- Agree in principle. The PPDU format, DCM, 106-tone RU selection rules of the control response frame are changed to the recommendation. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| **27.15.2 PPDU format selection** ***TGax Editor: Change 10th paragraph of the subclause 27.15.2 as follows:*** An HE STA shall send Control frames following the rules defined in 10.7.6 (Rate selection for Control frames)) with the following exceptions:* …
* A Control frame sent as a response to an HE ER SU PPDU that does not solicit an HE TB PPDU ~~shall~~ should be carried in an S-MPDU in an HE ER SU PPDU unless the most recently received PPDU(#11692) sent by the responding STA to the soliciting STA after association was not an HE ER SU PPDU in which case the Control frame ~~shall~~ should be carried in non-HT PPDU. (16689)
* A Control frame sent as a response to an HE SU PPDU that does not solicit an HE TB PPDU ~~shall~~ should be carried in a non-HT PPDU unless the most recent received PPDU(#11692) sent by the responding STA to the soliciting STA after association was an HE ER SU PPDU in which case the Control frame ~~shall~~ should be carried in an S-MPDU in an HE ER SU PPDU. (16689)

**27.15.3 MCS, NSS, BW and DCM selection** ***TGax Editor: Change 1st paragraph of the subclause 27.15.3 as follows:*** An HE STA shall follow the rules defined in 10.7 (Multirate support) and 27.15.4 (Rate selection constraints for HE STAs) for selecting the rate, MCS, NSS, and the rules defined in 10.3.2.6 (VHT RTS procedure), 10.3.2.7 (CTS and DMG CTS procedure), 10.7.6.6 (Channel Width selection for Control frames) and 10.7.11 (Channel Width in non-HT and non-HT duplicate PPDUs) for selecting the channel width (BW) of transmitted PPDUs with the following exceptions:* MCS, NSS, and BW selection for an HE TB PPDU are defined in 27.5.3.3 (STA behavior for UL MU operation).
* Rate and BW selection for a CTS sent in response to an MU-RTS Trigger frame(#13317) are defined in 27.2.5 (MU-RTS/CTS procedure)
* ~~MCS, and NSS for a Control frame sent in response to an HE ER SU PPDU shall be <MCS0, 1> when the Control frame is carried in an HE ER SU PPDU and the data rate is 6 Mb/s when the Control frame is carried in a non-HT PPDU (see 10.7.6.5 (Rate selection for control response frames)).~~
* A STA that transmits a Control frame carried in a non-HT PPDU that is a response to a frame received in an HE ER SU PPDU shall set the rate of the non-HT PPDU to 6 Mb/s.
* A STA that transmits a Control frame carried in an S-MPDU in an HE ER SU PPDU that is a response to a frame received in an HE ER SU PPDU shall use the <HE-MCS, NSS> tuple <MCS 0, 1>.
* NSS and BW selection is further constrained as defined in 27.8 (Operating mode indication), 11.42 (Notification of operating mode changes) and 27.15.2 (PPDU format selection).

***TGax Editor: Change 11th paragraph of the subclause 27.15.3 as follows:*** An HE STA that sends a Control frame in an HE ER SU PPDU format ~~shall~~ should use:* DCM encoding if the most recent successfully received PPDU sent by the HE STA, after association, to the STA soliciting the control frame used DCM; otherwise the STA ~~shall~~ should not use DCM for the Control frame.
* 106-tone HE ER SU PPDU if the most recent successfully received PPDU sent by the HE STA, after association, to the STA soliciting the control frame was a 106-tone HE ER SU PPDU; otherwise the STA ~~shall~~ should not use a 106-tone HE ER SU PPDU for the Control frame.(#12653) (16689)
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| 16143 | 367.13 | 27.15.3 | The DCM Max BW constraint needs to be applied to requests in Trigger frames too, not just | At the end of the referenced paragraph add a sentence "An HE AP shall not set the UL BW subfield of the Common Info field in aTrigger frame to a value greater than that indicated in any of the recipient STAs' DCM Max BW subfieldsin the HE PHY CapabilitiesInformation field of the HE Capabilities element. | Revised- Agree in principle. TGax editor makes changes as shown in the as specified in 11-18/1778r0. |
| ***TGax Editor: Change 8th paragraph of the subclause 27.15.3 as follows:*** An HE STA may transmit an HE PPDU with DCM to a recipient STA if it has received from the recipient STA an HE Capabilities element with the DCM Max Constellation Rx subfield in the HE PHY Capabilities Information field greater than 0; otherwise the HE STA shall not transmit an HE PPDU with DCM to the recipient STA. ~~The bandwidth of the HE PPDU with DCM that an HE STA transmits to a recipient STA shall be equal to or less than the bandwidth indicated by the DCM Max BW subfield in the HE PHY Capabilities Information field in the HE Capabilities element received from the recipient STA.~~ An HE STA transmits an HE TB PPDU with DCM as defined in 27.5.3.3 (STA behavior for UL MU operation). When sending a Trigger Frame, the HE AP shall not set the DCM subfield of User Info field in the Trigger Frame to 1 if the destination non-AP HE STA sets the DCM Max Constellation Tx field to 0 in the HE PHY Capabilities Information field.An HE STA that transmits an HE PPDU with DCM to a recipient STA shall use a bandwidth that is less than or equal to the value indicated in the DCM Max BW subfield in the HE PHY Capabilities Information field in the HE Capabilities element received from the recipient STA. An HE AP that transmits a Trigger frame addressed to a recipient STA that solicits an HE TB PPDU with DCM, shall set the UL BW subfield in the Trigger Frame to less than or equal to the value indicated in the DCM Max BW subfield in HE PHY Capabilities Information field in the HE Capabilities element received from the recipient STA.An HE STA that transmits an HE PPDU with DCM to a recipient STA shall use an NSS that is less than or equal to the value indicated in the DCM Max NSS Rx subfield in the HE PHY Capabilities Information field in the HE Capabilities element received from the recipient STA. An HE AP that transmits a Trigger frame addressed to a recipient STA that solicits an HE TB PPDU with DCM, shall set the Number of Spatial Streams subfield in the Trigger Frame to less than or equal to the value indicated in the DCM Max NSS Rx subfield in HE PHY Capabilities Information field in the HE Capabilities element received from the recipient STA.An HE AP shall not set the UL STBC subfield in the Trigger Frame that solicits an HE TB PPDU with a bandwidth less than or equal to 80 MHz to 1 if at least one User Info field is addressed to a non-AP HE STA from which the HE AP has received an HE Capabilities element with the STBC Tx $\leq $80 MHz subfield in HE PHY Capabilities Information field equal to 0. An HE AP shall not set the UL STBC subfield in the Trigger Frame that solicits an HE TB PPDU with a bandwidth greater than 80 MHz to 1 if at least one User Info field is addressed to a non-AP HE STA from which the HE AP has received an HE Capabilities element with the STBC Tx $>$80 MHz subfield in HE PHY Capabilities Information field equal to 0.***TGax Editor: Change Table 9-322b (Subfields of the HE PHY Capabilities Information field) as follows:***

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| --- | --- | --- |
| STBC Tx $\leq $80 MHz | Indicates support for the transmission of an HE TB PPDU that has a bandwidth less than or equal to 80 MHz and is using STBC and with one spatial stream.  | Set to 0 if not supported. Set to 1 if supported. |
| … | … | … |
| STBC Tx $>$80 MHz | Indicates support for the transmission of an HE TB PPDU that has a bandwidth greater than 80 MHz and is using STBC with one spatial stream. | Set to 0 if not supported. Set to 1 if supported. |

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