IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comment resolutions for Selection rules (27.15) | | | | |
| Date: 2017-02-22 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Alfred Asterjadhi | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92109 | +1-858-658-5302 | aasterja@qti.qualcomm.com |
| George Cherian | Qualcomm Inc. |  |  |  |
| Abhishek Patil | Qualcomm Inc. |  |  |  |
| Raja Banerjea | Qualcomm Inc. |  |  |  |

Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (52 CIDs):

* 4789, 4808, 5217, 5218, 5219, 5220, 5221, 5511, 5518, 7034, 7035, 7154, 7581, 7582, 7583, 8525, 8526, 8616, 8617, 8729, 8730, 9732, 9961, 9962, 9963, 9964 (26 CIDs)
* 5222, 5223, 5224, 5225, 5226, 7584, 7585, 7586, 9751, 9965, 9966 11 CIDs)
* 3256, 3354, 3461, 3775, 3858, 4301, 4925, 5227, 5228, 7587, 7588, 7589, 7590, 7591, 7592 (15 CIDs)

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Upgraded text to 802.11ax D1.1 (editorial change highlighted in green).

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.***

# PARS I (27.15.2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P** | **L** | **Comment** | **Proposed Change** | **Resolution** |
| 4789 | Alfred Asterjadhi | 201 | 37 | This capability has nothing to do with the reception of the HE trigger-based PPDU. It has to do with the reception of the UL MU PPDU as provided by motioned comment resolution 11/16/1419r0. Also keep consistency of the capability field name, in the HE Caps, and here. | As in comment. | Revised –  Agree with the comment. Proposed resolution fixes the issue as suggested by the comment.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 4789. |
| 4808 | Alfred Asterjadhi | 201 | 26 | The 242-tone ER SU PPDU can be transmitted to another STA if the other STA supports either DCM or 106tone RU. Otherwise what is the benefit? Please clarify the conditional reception (inlien with filosophy of P202L51). | As in comment. | Revised –  Agree with the comment. Proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 4808. |
| 5217 | Dorothy Stanley | 201 | 28 | Can an HE non-AP STA transmit an HE MU PPDU? Please clarify. | as in comment | Revised –  An HE non-AP STA can transmit an HE MU PPDU to a peer STA if the peer STA supports its reception. Proposed resolution clarifies this.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 5217. |
| 5218 | Dorothy Stanley | 201 | 38 | "UL MU PPDU Support" isn't defined | define | Revised –  Agree in principle with the comment. There is an inconsistency in the field names, as in HE Capabilities element this field is called UL HE MU PPDU Payload Support. Resolution fixes the inconsistency.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 5218. |
| 5219 | Dorothy Stanley | 201 | 38 | pg 9, line 31 states "Mandatory support for DL and UL OFDMA", which seems to conflict with the intent here that there is an HE Capability that allows the STA to not support UL MU | clarify | Revised –  Agree with the comment. There has been some misinterpretation of the past documents. Prosed resolution fixes the issue. See CID 4789 for more info.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 5219. |
| 5220 | Dorothy Stanley | 201 | 42 | I think this statement is categorically wrong "An HE STA shall send Control frames in non-HT PPDU format following the rules defined in 10.7.6" because there are a lot of conditions in 10.7.6 that do not require non-HT PPDU format. | Perhaps change the sentence to "An HE STA shall send Control frames following the rules defined in 10.7.6 (Rate selection for Control frames)) with the following exceptions:" | Accepted |
| 5221 | Dorothy Stanley | 202 | 4 | I don't see a definition for ER SU PPDU | add definition | Revised –  Agree with the comment. Proposed resolution is to add definition for HE ER SU PPDU in subclause 3.2.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 5221. |
| 5511 | Graham Smith | 24 | 201 | "An HE STA may transmit non-HT, HT, VHT PPDUs". IS the rule that an HE STA shall be capable of transmitting all these or is it all optional. I would suspect that the intention is that an HE STA shall be capable, if so needs to say so. | Replace cited text with "An HE STA shall be capable of transmitting non-HT, HT, VHT PPDUs" | Revised –  There is no requirement for an HE STA to transmit HT, VHT PPDUs. I.e.,, it is a choice of the STA if it choses to do so, but when it does it has to follow the rules defined in 10.7. Proposed resolution clarifies this aspect.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 5511. |
| 5518 | Graham Smith | 202 | 28 | "Supported HE-MCS and NSS Set field in the HE Capabilities element". I can't find this field in the HE Capabilities element. I can find "Tx Rx HE MCS NSS Support" is that it? Also I only find detailed "Tx Rx HE MCS Support field" (Hmm... That's also an error). Which is it? | First correct Figure 9-589cj "Tx Rx HE MCS NSS Support" to read "Tx Rx HE MCS Support" Then change cited text to "Tx Rx HE MCS Support field in the HE Capabilities element" | Revised –  Agree with the comment. Proposed resolution accounts for the suggested changes. Although the suggestion is to have the name of the field as Supported HE-MCS and NSS Set throughout the draft, which is similar to the name of the same field in 11ac.  Note to editor: Changes are in part II and part III of the resolution doc.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 5518. |
| 7034 | Ju-Hyung Son | 201 | 28 | An HE non-AP STA may transmit HE MU PPDU also. Please clarify the case in this section. | Insert the following sentence in Line 28. "An HE non-AP STA may transmit an HE MU PPDU to an HE AP if it has received from the HE AP an HE Capabilities element with the UL HE MU PPDU Payload Support field equal to 1; otherwise the STA shall not trasmit HE MU PPDU to the HE AP." | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 7034. |
| 7035 | Ju-Hyung Son | 201 | 36 | How an HE non-AP STA can transmit HE trigger-based PPDU to a peer STA without receiving the soliciting Trigger frame? | Please clarify the case where an HE non-AP STA can transmit HE Trigger-based PPDU to a peer STA without receiving the soliciting Trigger frame. Otherwise remove the sentence "An HE non-AP STA ~ to the peer STA." | Revised –  Agree in principle with the comment. This statement is intended for transmission of HE UL MU PPDUs from the STA, not HE Trigger-based PPDUs. Proposed resolution fixes this inconsistency.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 7035. |
| 7154 | kaiying Lv | 201 | 38 | In HE Capabilities element,there is no UL MU PPDU Support field. | Please Clarify it. | Revised –  Agree in principle with the comment. Proposed resolution is to fix the inconsistency in the names given to the field in two different locations of the spec.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 7154. |
| 7581 | Liwen Chu | 201 | 36 | "change the paragraph to ""An HE non-AP STA may transmit an HE MU PPDU to a peer STA if it has received from the peer STA an HE Capabilities element with the UL MU PPDU Support field equal to 1; otherwise the STA shall not transmit an HE MU PPDU to the peer STA""" | As in comment | Revised –  Agree with comment. Proposed resolution incorporates gthe suggested change (made some editorial fixes for consistency with other CIDs).  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 7581. |
| 7582 | Liwen Chu | 201 | 44 | "Two issues here:  1), HE TRIG PPDU in STBC shouldn't use HE TRIG PPDU since HE TRIG PPDU is only from STA to AP. As a TXOP holder, AP can send wantever PPDU it wants to use. This also contradicts with the following bullet. So HE TRIG PPDU should be removed from the bullet.  2, HE MU PPDU should be added to the bullet." | As in comment | Revised –  Agree with the first issue. Disagree with the second issue because the control frame sent as a response to the MU PPDU depends on what format the AP is soliciting the response, e.g., non-HT PPDU, or TB PPDU.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 7582. |
| 7583 | Liwen Chu | 201 | 53 | This bullet should be removed since there is no support of transmiting FTM in various HE PPDU formats. | As in comment | Rejected –  An FTM frame is a Management frame that can be sent in various HE PPDUs. The only part missing is to explicitly specify the format (so that it is not only covered by the value 0 (no preference) in the FTM Format and Bandwidth field of the FTM Parameters element.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 8525. |
| 8525 | Robert Stacey | 201 | 44 | An HE trigger-based PPDU is ONLY sent in response to a Trigger frame. So it is not possible to send a Control frame response in the same PPDU format. Also, why can't the PPDU format be non-HT? | Fix | Revised –  Agree with the comment. Proposed resolution remove the Trigger-based PPDU from the list as it is not correct. Also the PPDU can be non-HT. These are exceptions to the non-HT PPDU format.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 8525. |
| 8526 | Robert Stacey | 201 | 50 | Why is it important that the Trigger frame be in an HE PPDU? If the Trigger frame is in a non-HT PPDU or VHT PPDU the response is the same. Why does it matter that it's a Control response? If it's a QoS Data response it's carried in the same PPDU format. | Fix | Revised—  Agree with the comment. It is not important that it is an HE PPDU (removing the HE classifier).  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 8526. |
| 8616 | Sigurd Schelstraete | 201 | 37 | "An HE non-AP STA may transmit an HE trigger-based PPDU to a peer STA if it has received from the peer STA an HE Capabilities element with the UL MU PPDU Support field equal to 1; otherwise the STA shall not transmit an HE trigger-based PPDU to the peer STA.". Do we even need this requirement? HE Trigger-based PPDUs should only be sent in response to a Trigger Frame sent by the peer STA. If the peer STA doesn't want to receive trigger-based PPDUs, it should not send a Trigger Frame. | Clarify | Revised –  Agree with the comment. The statement is incorrect as it should refer to transmission of UL MU PPDUs rather than Trigger-based PPDUs. Proposed resolution fixes this issue.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 8616. |
| 8617 | Sigurd Schelstraete | 201 | 38 | Name of field should be "UL MU" instead of "UL MU PPDU Support" | Correct name of field | Revised –  Agree in principle with the comment. Actually the correct capability bit is UL HE MU PPDU Support. Proposed resolution fixes this issue.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 8617. |
| 8729 | Sigurd Schelstraete | 201 | 28 | Change "An HE AP transmits" to "An HE AP may transmit", as in the paragraph above | See comment | Rejected –  These are declarative statements as the normative statements have already been defined in 27.5.1 (HE DL MU operation). No changes are required in this subclause. |
| 8730 | Sigurd Schelstraete | 201 | 28 | Change "An HE non-AP transmits" to "An HE non-AP may transmit", as in the paragraph above | See comment | Rejected –  These are declarative statements as the normative statements have already been defined in 27.5.2 (HE DL MU operation). No changes are required in this subclause. |
| 9732 | Yongho Seok | 201 | 37 | """An HE non-AP STA may transmit an HE trigger-based PPDU to a peer STA if it has received from the peer STA an HE Capabilities element with the UL MU PPDU Support field equal to 1; otherwise the STA shall not transmit an HE trigger-based PPDU to the peer STA.""  Does a peer STA mean a non-AP STA? If it is yes, it does not make sense. An HE trigger-based PPDU is always addressed to an AP STA.  Does a peer STA mean an AP STA? If it is yes, it still does not make sense. For an HE trigger-based PPDU transmission, any capability check is not needed.  Please clarify it. | As per comment. | Revised –  Agree with the comment. This statement was supposed to cover the case of transmission of an HE UL MU PPDU, instead of HE Trigger-based PPDU. Somehow there was an error in the incorporation of the approved document. Proposed resolution fixes this inconsistency.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 9732. |
| 9961 | Young Hoon Kwon | 201 | 28 | It is not clear in which case a non-AP STA can transmit HE MU PPDU. Need clarification | As in the comment. | Revised –  The non-AP STA uses the HE MU PPDU format, instead of the HE SU PDPDU format, in those cases when it is beneficial to have the transmit identifier in the PHY preamble of the PPDU. Since there is no standard related behavior required for this functionality the proposal is to add a note mentioning this case and specifying that the details of the operation are out of scope of the standard.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 9961. |
| 9962 | Young Hoon Kwon | 201 | 38 | There's no UL MU PPDU Support field defined in HE Capabilities element. Need further clarification. | As in the comment. | Revised –  Agree with the comment. Proposed resolution clarifies this aspect by fixing the capabilities bit naming.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 9962. |
| 9963 | Young Hoon Kwon | 201 | 57 | This behaviour is for responder. It is not clear how can a responder know if the most recent PPDU sent by the responding STA to the soliciting STA is successful or not. Needs further clarification. | As in the comment. | Revised –  Generally it should be clear that a PPDU is determined to be successfully received if the STA receives an acknowledgment. In order to avoide ambiguity the proposed resolution adds a declarative statement as a note for this case.  TGax editor to make the changes shown in 11-17/0237r0 under all headings that include CID 9963. |
| 9964 | Young Hoon Kwon | 202 | 1 | Based on this rule, once a responder uses ER SU PPDU format for control response frame, it shall use ER SU PPDU format forever, even if the channel condition becomes better or the responder approaches to the soliciting STA. (Even if the frame transmission fails, as ER SU PPDU format is the lowest MCS, there's no reason to switch back to non-HT frame format.) I think it's better to give a chance for the responder to switch back to non-HT PPDU format if channel conditions becomes better. | As in the comment. | Rejected –  The rule states that the Control frame shanll be carried in non-HT PPDU except when the most recent successfully received PPDU sent by the responding STA is an HE ER SU PPDU in which case the CTRL frame shall be carried in ER SU PPDU. As such, if the most recent successfully received PPDU sent by the responding STA is not an ER SU PPDU then the control response shall be carried in non-HT PPDU. I.e. the most recent frame sent by the responding STA determines the format of the PPDU carrying the control response frame. |

## Discussion: *None.*

**9.4.2.168 Fine Timing Measurement Parameters element**

The FTM Format And Bandwidth(#3464) field indicates the requested or allocated(M56) packet format and bandwidth(Ed) used by all(M56) Fine Timing Measurement frames in an FTM session and is shown in Table 8-247 (FTM Format And Bandwidth field). The value 0 indicates no preference by the initiating STA and is not used by the responding STA.

TGax Editor: *Change the paragraph below of this subclause as follows (#CID 7583):*

|  |  |  |
| --- | --- | --- |
| * FTM Format And Bandwidth(#3464) field(#2164) | | |
| Field Value | Format(Ed) | Bandwidth(M56) (MHz) |
| 0 | No preference | No preference |
| 1-3(#3267) | Reserved(#3267) | Reserved(#3267) |
| 4(#3267) | Non-HT(Ed) | 5 |
| 5(#3267) | Reserved(#3267) | Reserved(#3267) |
| 6(#3267) | Non-HT(Ed) | 10 |
| 7(#3267) | Reserved(#3267) | Reserved(#3267) |
| 8(#3267) | Non-HT,(Ed) excluding Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM -applications) and Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY -specification) | 20 |
| 9(#3267) | HT mixed(Ed) | 20 |
| 10(#3267) | VHT | 20 |
| 11(#3267) | HT mixed(Ed) | 40 |
| 12(#3267) | VHT | 40 |
| 13(#3267) | VHT | 80 |
| 14(#3267) | VHT | Noncontiguous 80+80(#3267) |
| 15(#3267) | VHT (two separate RF LOs)(#3267) | Contiguous 160(#3267) |
| 16(#3267) | VHT (single RF LO)(#3267) | Contiguous 160(#3267) |
| 17(#3267) | HE | 20 |
| 18(#3267) | HE(Ed) | 40 |
| 19(#3267) | HE | 80 |
| 20(#3267) | HE | Noncontiguous 80+80 |
| 21(#3267) | HE (two separate RF LOs) | Contiguous 160 (#3267) |
| 22(#3267) | HE (single RF LO)(#3267) | Contiguous 160*(#7583)*(#3267) |
| 23-30*(#7583)* (#3267) | Reserved | Reserved |
| 31(#3267) | DMG | 2160 |
| 32–63(#3267) | Reserved | Reserved |

**TGax Editor: *Replace “Tx Rx HE MCS Support” with “Supported HE-MCS and NSS Set” throughout the draft.(#5518, 7587, 7589)***

**TGax Editor: *Replace “UL HE MU PPDU Payload Support” with “UL HE MU PPDU Support” throughout the draft.(#5218, 7154, 9962)***

**TGax Editor: *Insert the following definition in subclause 3.2 (Definitions specific to IEEE 802.11) (#CID 5221, 5222, 5525, 5526):***

**High efficiency (HE) extended range (ER) single user (SU) physical layer (PHY) protocol data unit (PPDU):** A Clause 28 (High Efficiency (HE) PHY specification PPDU) with the TXVECTOR parameter FORMAT equal to HE\_EXT\_SU.*(#5221, 5222)*

* PPDU format, BW, MCS, NSS, and DCM selection rules
* General

An HE STA can transmit different PPDUs formats, with different transmit parameters, such as channel width, MCS, NSS, DCM. This subclause defines the rules followed by an HE STA for selecting these parameters depending on the capabilities of the intended receiver(s) and other considerations.

* PPDU format selection

TGax Editor: *Change the paragraph below of this subclause as follows (#CID 5511, 4808):*

An HE STA that transmits non-HT, HT, or VHT PPDUs shall follow*(#5511)* the rules defined in 10.7 (Multirate support). An HE STA may transmit an HE SU PPDU *(#4808)* to a peer HE STA.

An HE AP transmits HE MU PPDUs as defined in 27.5.1 (HE DL MU operation). An HE non-AP STA transmits HE trigger-based PPDUs as defined in 27.5.2 (UL MU operation).

TGax Editor: *Change the paragraph below of this subclause as follows (#CID 4808):*

An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the DCM Rx field equal to 1 or with the ER SU Payload field equal to 1; otherwise the STA shall not transmit a 242-tone HE ER SU PPDU to the peer STA.*(#4808)* An HE STA may transmit a 106-tone HE ER*(#Ed)*  SU PPDU to a peer STA if it has received from the peer STA an HE Capabilities element with the HE ER*(#Ed)* SU PPDU Payload field equal to 1; otherwise the STA shall not transmit a 106-tone HE ER*(#Ed)*  SU PPDU to the peer STA.

TGax Editor: *Change the paragraph below of this subclause as follows (#CID 4789, 5218, 5219, 7034, 7035, 7581, 8617, 9732, 9961, 9962, 8616):*

An HE non-AP STA may transmit an HE MU PPDU to a peer STA if it has received from the peer STA an HE Capabilities element with the UL MU PPDU Support field equal to 1; otherwise the STA shall not transmit an HE MU to the peer STA.*(#4789, 5217, 5218, 5219, 9962, 9961, 7034, 7035, 7154, 7581, 8617, 9732, 9962, 8616)*

NOTE—A non-AP STA transmitting an HE MU PPDU sets the TXVECTOR parameter UPLINK\_FLAG to 1 (see 27.11.2 (UPLINK\_FLAG). The UL MU PPDU format enables the non-AP STA to include its AID (i.e., transmitter’s AID) in the PHY header of the PPDU and its use is out of scope of the standard.*(#4789, 5217, 5218, 5219, 7034, 9961)*

TGax Editor: *Change the paragraph below of this subclause as follows (#CID 8525, 8526, 7582, 5220, 9963):*

An HE STA shall send Control frames *(#5220)* following the rules defined in 10.7.6 (Rate selection for Control frames)) with the following exceptions:

* A Control frame sent in response to an HE ER*(#Ed)* SU PPDU, HE SU PPDU*(#8525, 7582)* that uses STBC shall be carried in the same format as the soliciting PPDU
* A Control frame sent by the AP as a response to an HE trigger-based PPDU may be carried in any PPDU format that is supported by the intended receiver(s)
* A Trigger frame that is not an MU RTS may be carried in any PPDU format that is supported by the intended receiver(s).*(#8526)*
* A Control frame sent as a response to a PPDU*(#8526)*, containing a Trigger frame that is not an MU RTS or containing an UL MU Response Scheduling A-Control field, is carried in an HE trigger-based PPDU (see 27.5.2 (UL MU operation))
* An Ack frame sent as a response to an HE ER*(#Ed)* SU PPDU, 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*(#9963)*
* If a Control frame is sent as a response to a soliciting HE ER*(#Ed)* SU PPDU the frame shall be carried in an HE ER*(#Ed)* SU PPDU except when the most recent successfully received PPDU sent by the responding STA to the soliciting STA after association was not an HE ER*(#Ed)* SU PPDU in which case the control frame shall be carried in non-HT PPDU
* If the Control frame is sent as a response to a soliciting HE SU PPDU then the frame shall be carried in non-HT or non-HT duplicate PPDU except when the most recent successfully received PPDU sent by the responding STA to the soliciting STA after association was an HE ER*(#Ed)* SU PPDU in which case the control frame shall be carried in HE ER*(#Ed)* SU PPDU

NOTE—PPDU format switching between non-HT and ER SU PPDU occurs in subsequent TXOPs. A STA that solicits a control frame from a responding STA accounts for the PPDU format of the control frame to calculate the expected duration of the TXOP. The responding STA determines that the most recent PPDU sent to the soliciting STA is successfully received if it receives an immediate acknowledgment by the soliciting STA in response to the PPDU.*(#9963)*

# PARS II (27.15.3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P** | **L** | **Comment** | **Proposed Change** | **Resolution** |
| 5222 | Dorothy Stanley | 202 | 21 | I don't see a definition for ER SU PPDU | add definition | Revised –  Agree with comment. Proposed resolution is to add definition.  Note to editor: Changes are in part I of the resolution doc.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 5222. |
| 5223 | Dorothy Stanley | 202 | 32 | I think this statement is way too restrictive, "The STA shall select a <HE-MCS, NSS> tuple from the basic HE-MCS and NSS set when protection is required (as defined in 10.26 (Protection mechanisms))", there is no need to always use basic HE-MCS and NSS sets when protection is required. 10.26 itself talks about using RTS/CTS as a protection mechanism, so with that the subsequent PPDU should not have use a basic HE-MCS. | modify statement | Revised –  Agree with the comment. Proposed resolution is to remove the statement and add a similar statement that applies to VHT STAs (see 10.26.6 (protection rules for VHT STAs)).  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 5223. |
| 5224 | Dorothy Stanley | 202 | 42 | Regarding, "called the CandidateMCSSet as described in 10.7.6.5.3". The description in 10.7.6.5.3 applies to HT and VHT, but does not include HE. | modify rules here or in 10.7.6.5.3 to address HE | Revised –  Agree with the comment. Proposed resolution is to specify that the CandidateMCSSet additionally contains the <HE MCS, NSS> tuples in this subclause.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 5224. |
| 5225 | Dorothy Stanley | 202 | 51 | I don't see a definition for ER SU PPDU | add definition | Revised –  Agree with comment. Proposed resolution is to add definition.  Note to editor: Changes are in part I of the resolution doc.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 5225. |
| 5226 | Dorothy Stanley | 202 | 57 | I don't see a definition for ER SU PPDU | add definition | Revised –  Agree with comment. Proposed resolution is to add definition.  Note to editor: Changes are in part I of the resolution doc.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 5226. |
| 7584 | Liwen Chu | 202 | 21 | "and BW shall be 20 MHz" should be removed from the bullet since responding BW rules already cover this. | As in comment | Accepted |
| 7585 | Liwen Chu | 202 | 30 | "Change ""When the Supported HE-MCS and NSS set of the receiving STA or STAs is not known, the transmitting STA shall transmit using a <HE-MCS, NSS> tuple in the basic HE-MCS and NSS set."" to "When the Supported HE-MCS and NSS set of the  receiving STA or STAs is not known, the transmitting STA shall transmit using a <HE-MCS, NSS> tuple in  the basic HE-MCS and NSS set if basic HE MCS and NSS set is not idle, otherwise the transmitting STA shall transmit using a <HE-MCS, NSS> tuple in  the mandatory HE-MCS and NSS set" | As in comment | Revised –  Agree in principle with the comment. Some editorial changes in the proposed changes (idle is not correct, using empty).  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 7585. |
| 7586 | Liwen Chu | 202 | 33 | The text is ambiguous since the protection levels are different per the environment. | Delete the last sentence and add the related text to protection subclause if necessaey. | Revised –  Agree with the comment. Proposed resolution is to remove the statement and add a similar statement that applies to VHT STAs (see 10.26.6 (protection rules for VHT STAs)).  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 7586. |
| 9751 | Yongho Seok | 202 | 24 | "NSS and BW selection is further constrained as defined in 27.8 (Operating mode indication) and 11.42 (Notification of operating mode changes)." The BW selection is also constrained by 27.15.2 (PPDU format selection). Add 27.15.2 as additional constraint and specify additional BW selection caused by 27.15.2. | As per comment. | Revised –  Agree in principle with the comment. Incorporated the suggested change.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 79751. |
| 9965 | Young Hoon Kwon | 202 | 21 | Control response frame in response to an ER SU PPDU can be either ER SU PPDU or non-HT PPDU format based on 27.15.2. <MCS0, 1> is only applicable to ER SU PPDU. Further clarification is needed if the control response frame is using non-HT PPDU format. | As in the comment. | Revised –  In both cases the MCS is 0 (note that the MCSs of an ER SU PPDU can be 0, 1, 2), which is the MCS that falls on when using current MCS selection rules for control response. Proposed resolution is to clarify this aspect.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 9965. |
| 9966 | Young Hoon Kwon | 202 | 53 | Based on this rule, once a responder uses DCM or 106-tone, it needs to use it forever even though channel conditions becomes better. I think it's better to give a chance for the responder to switch back to DCM-off or 242 tone format. | As in the comment. | Revised –  Agree in principle with the comment. The otherwise sentence is missing in this item. Proposed resolution is to add the otherwise statement.  TGax editor to make the changes shown in 11-17/0237r1 under all headings that include CID 9966. |

## Discussion: *None.*

* MCS, NSS, BW and DCM selection

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 5222, 9965, 7584):***

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 a Trigger-based PPDU are defined in 27.5.2.3 (STA behavior).
* Rate and BW selection for a CTS sent in response to MU RTS are defined in 10.3.2.8a.3 (CTS response to MU-RTS)
* MCS, and NSS for a Control frame sent in response to an HE ER SU PPDU*(#5222)* 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)). *(#9965, 7584)*
* NSS and BW selection is further constrained as defined in 27.8 (Operating mode indication), 11.42 (Notification of operating mode changes), and in 27.15.2 (PPDU format selection). *(#9751)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 5518, 7585, 7586, 5523):***

An HE STA that transmits an HE PPDU shall use an <HE-MCS, NSS> tuple supported by the receiver STA. A <HE-MCS, NSS> tuple is supported if reported as such in the Supported HE-MCS and NSS Set field in the HE Capabilities element received from that STA. When the Supported HE-MCS and NSS set of the receiving STA or STAs is not known, the transmitting STA shall transmit using a <HE-MCS, NSS> tuple in the basic HE-MCS and NSS set if the basic HE MCS and NSS set is not empty, otherwise the transmitting STA shall transmit using a <HE MCS, NSS> tuple in the mandatory HE-MCS and NSS Set.*(#7585)*. An HE STA is subject to all of the rules for HT STAs and VHT STAs that apply to its operating band (see 10.26 (Protection mechanisms)).*(#5523, 7586)*

If a control response frame is to be transmitted within an HE SU PPDU, HE MU PPDU, the channel width (CH\_BANDWIDTH parameter of the TXVECTOR) shall be selected first according to 10.7.6.6 (Channel Width selection for Control frames), and then the <HE-MCS, NSS> tuple shall be selected from a set of <HE-MCS, NSS> tuples called the *CandidateMCSSet*. The *CandidateMCSSet* is as defined in 10.7.6.5.3 (Control response frame MCS computation) except that the set additionally contains the <HE-MCS, NSS> tuples for an HE STA*(#5524)*.

An HE STA may transmit an HE PPDU with DCM to a peer STA if it has received from the peer STA an HE Capabilities element with the DCM Encoding Rx field equal to 1; otherwise the STA shall not transmit a HE PPDU with DCM to the peer STA. An HE STA transmits an HE trigger-based PPDU with DCM as defined in 27.5.2.3 (STA behavior).

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 9966):***

An HE STA that sends a control frame in an HE ER SU PPDU format shall use:

* DCM encoding if the most recent successfully received PPDU sent by the HE STA to the soliciting STA after association used DCM; otherwise the STA shall 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 to the soliciting STA after association was a 106-tone HE ER SU PPDU; otherwise the STA shall not use a 106-tone HE ER SU PPDU for the control frame. *(#9966)*

NOTE—TX parameter switching occurs in subsequent TXOPs. A STA that solicits a control frame from a peer STA accounts for the TX parameter of the control frame to calculate the expected duration of the TXOP. The responding STA determines that the most recent PPDU sent to the soliciting STA is successfully received if it receives an immediate acknowledgment by the soliciting STA in response to the PPDU.*(#9963)*

# PARS III (27.15.4)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P** | **L** | **Comment** | **Proposed Change** | **Resolution** |
| 3256 | Albert Petrick | 203 | 18 | HE Capabilities Element clause number incorrect | Change clause number to "9.4.2.218" | Revised –  Agree with the commenter. Actually it is a reference to a subclause of 9.4.2.218. Accounted in the resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 3256. |
| 3354 | Albert Petrick | 203 | 18 | HE Capabilities Element clause number incorrect | Change clause number to "9.4.2.218" | Revised –  Agree with the commenter. Actually it is a reference to a subclause of 9.4.2.218. Accounted in the resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 3354. |
| 3461 | Albert Petrick | 203 | 18 | HE Capabilities Element clause number incorrect | Change clause number to "9.4.2.218" | Revised –  Agree with the commenter. Actually it is a reference to a subclause of 9.4.2.218. Accounted in the resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 3461. |
| 3775 | Albert Petrick | 203 | 18 | HE Capabilities Element clause number incorrect | Change clause number to "9.4.2.218" | Revised –  Agree with the commenter. Actually it is a reference to a subclause of 9.4.2.218. Accounted in the resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 3775. |
| 3858 | Albert Petrick | 203 | 18 | HE Capabilities Element clause number incorrect | Change clause number to "9.4.2.218" | Revised –  Agree with the commenter. Actually it is a reference to a subclause of 9.4.2.218. Accounted in the resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 3858. |
| 4301 | Albert Petrick | 203 | 18 | HE Capabilities Element clause number incorrect | Change clause number to "9.4.2.218" | Revised –  Agree with the commenter. Actually it is a reference to a subclause of 9.4.2.218. Accounted in the resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 4301. |
| 4925 | Brian Hart | 203 | 54 | From deep practical experience, these rules are the workhorse and pot of gold for high density networks (during 11a, and 11n days, and continuing into VHT days). However D1.0 continues with the "should" logic that was a weak VHT compromise given the pre-ratification product being developed. However, given how early we are in 11ax, there is no technical or practical reason why this "should" shouldn't be upgraded to a "shall". | Replace "should" by "shall" in section 27.15.4.3 (2x) | Revised –  There are technical reasons to not have a mandatory behavior for not restricting the use of low MCS in the network. For starters the STA may not be able to close the link with its AP due to this restriction. However to enable certain functionalities with higher MCSs the suggestion is to have a mandatory behavior only for those frames that could potentially have an adverse impact to high efficiency but still allow the STA to send MGMT and control frames with low and robust rates, i.e., these restrictions do not apply to at least non-HE PPDUs which is inline with the commenter’s proposed change.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 4925. |
| 5227 | Dorothy Stanley | 203 | 52 | Regarding, "The following apply for a STA that transmits a HE PPDU with a number of spatial streams (NSS) less than or equal to 8", can a STA transmit more than 8 SS? If not, then the sentence can be deleted | as in comment | Rejected—  The STA cannot transmit more than 8 SS but the statement is not incorrect as such there is no technical issue with this sentence. Please note that same wording is used in baseline (P1328L54). |
| 5228 | Dorothy Stanley | 203 | 55 | It is unclear why or how support of HE-MCS is related to support of reception of HT MCSs. Please clarify | as in comment | Rejected –  This subclause uses the same signaling that is defined for the rate selection constraints for VHT PPDUs, where the limitation of lower MCSs is provided by the Rx MCS bitmask field of the HT Capabilities element. Please refer to subclause 10.7.12.3 (Additional rate selection constraints for VHT PPDUs) for more information, and equivalen normative text in the VHT PPDU case. |
| 7587 | Liwen Chu | 203 | 9 | There is no such thing of Supported HE-MCS and NSS Set field. | Use the correct name. | Revised –  Agree with the comment. Proposed resolution is to correct the name in the HE Capabilities element, as this is name of the field is similar to the 11ac case.  Note to editor: Changes are located in Pars I of the document.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 7587. |
| 7588 | Liwen Chu | 203 | 14 | There is no such thing of Rx HE-MCS Map subfield | Use the correct name. | Revised –  Agree with the comment. Proposed resolution is to correct the name in the HE Capabilities element, as this name of the field is similar to the 11ac case.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 7588. |
| 7589 | Liwen Chu | 203 | 35 | There is no such thing of Supported HE-MCS and NSS Set field. | Use the correct name. | Revised –  Agree with the comment. Proposed resolution is to correct the name in the HE Capabilities element, as this name of the field is similar to the 11ac case.  Note to editor: Changes are located in Pars I of the document.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 7589. |
| 7590 | Liwen Chu | 203 | 40 | There is no such thing of Tx HE-MCS Map subfield | Use the correct name. | Revised –  Agree with the comment. Proposed resolution is to correct the name in the HE Capabilities element, as this name of the field is similar to the 11ac case.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 7590. |
| 7591 | Liwen Chu | 203 | 54 | Change "should" to "shall" | As in comment | Revised –  The comment is not very rich in details to motivate the request. The assumption is that it implicitly (I guess) refers to the same motivations of CID 4925. Please refer to that CID on the reasoning behind the proposed resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 7591. |
| 7592 | Liwen Chu | 203 | 61 | Change "should" to "shall" | As in comment | Revised –  The comment is not very rich in details to motivate the request. The assumption is that it implicitly (I guess) refers to the same motivations of CID 4925. Please refer to that CID on the reasoning behind the proposed resolution.  TGax editor to make the changes shown in 11-16/0237r1 under all headings that include CID 7592. |

## Discussion: *None.*

**TGax Editor: *Replace “Rx MCS NSS Descriptors” with “Rx HE\_MCS Map” throughout the draft (#CID 7588).***

**TGax Editor: *Replace “Tx MCS NSS Descriptors” with “Tx HE\_MCS Map” throughout the draft (#CID 7590).***

* Rate selection constraints for HE STAs
* Rx Supported HE-MCS and NSS Set

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 3526, 3354, 3461, 3775, 3858, 4301, 7587):***

The Rx Supported HE-MCS and NSS Set of a first HE STA is determined by a second HE STA for each <HE-MCS, NSS> tuple NSS = 1, …, 8 and bandwidth (20 MHz, 40 MHz, 80 MHz, and 160 MHz or 80+80 MHz) from the Supported HE-MCS and NSS Set field of the HE Capabilities element *(#7587)* received from the first STA as follows:

* If support for the HE-MCS for NSS spatial streams at that bandwidth is mandatory (see 26.5 (Parameters for HE-MCSs)), then the <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on receive.
* Otherwise, if the Max HE-MCS For n SS subfield (n = NSS) in the Rx HE-MCS Map subfield indicates support, then
* The <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on receive as defined in 9.4.2.218.3 (Supported HE-MCS and NSS Set field)*(#3526, 3354, 3461, 3775, 3858, 4301)*.
* Otherwise, the <HE-MCS, NSS> tuple at that bandwidth is not supported by the first STA on receive.

The <HE-MCS, NSS> tuples excluded by 27.15.4.3 (Additional rate selection constraints for HE PPDUs) can also be eliminated from the Rx Supported HE-MCS and NSS Set.

An HE STA shall not, unless explicitly stated otherwise, transmit a HE PPDU unless the <HE-MCS, NSS> tuple and bandwidth used are in the Rx Supported HE-MCS and NSS Set of the receiving STA(s).

* Tx Supported HE-MCS and NSS Set

The Tx Supported HE-MCS and NSS Set of a first HE STA is determined by a second STA for each <HE-MCS, NSS> tuple NSS = 1, …, 8 and bandwidth (20 MHz, 40 MHz, 80 MHz, and 160 MHz or 80+80 MHz) from the Supported HE-MCS and NSS Set field received from the first STA as follows:

* If support for the <HE-MCS, NSS> tuple at that bandwidth is mandatory (see 28.5 (Parameters for HE-MCSs)), then the <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on transmit.
* Otherwise, if the Max HE-MCS For *n* SS subfield (*n* = NSS) in the Tx HE-MCS Map subfield indicates support, then
* The <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on receive as defined in 9.4.2.218.4 (Tx Rx HE MCS Support field).
* Otherwise, the <HE-MCS, NSS> tuple at that bandwidth is not supported by the first STA on transmit.
* Additional rate selection constraints for HE PPDUs

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 4925, 7591, 7592):***

The following apply for a STA that transmits a HE PPDU with a number of spatial streams (NSS) less than or equal to 8:

* If the channel width of the PPDU is equal to CBW20 or CBW40, then the STA shall*(#4925, 7591, 7592)* not use a <HE-MCS, NSS> tuple if the HE-MCS is equal to 0, 1, 2, or 3 and the HT MCS with value VHT MCS + 8(NSS – 1) is marked as unsupported in the Rx MCS bitmask of the HT capabilities element of the receiver STA.
* If the channel width of the PPDU is equal to CBW80, CBW160, or CBW80+80, then the STA shall*(#4925, 7591, 7592)* not use a <HE-MCS, NSS> tuple if the HE-MCS is equal to 0 or 1 and both the HT MCS values 2 HE-MCS + 8(NSS – 1) and 2 (HE-MCS + 1) + 8 (NSS – 1) are marked as unsupported in the Rx MCS bitmask of the HT Capabilities element of the receiver STA.

An example tabulation of this behavior is given in Table 18-4 (Example of rate selection for HE PPDUs).

|  |  |  |
| --- | --- | --- |
| * Example of rate selection for HE PPDUs | | |
| HT MCSs that are marked as unsupported | <HE-MCS, NSS> tuples that are not used for  CBW20 and CBW40 | <HE-MCS, NSS> tuples that are not used for CBW80, CBW160, and CBW80+80 |
| 0, 8, 16 | <0, 1>, <0, 2>, <0, 3> | - |
| 1, 9 | <1, 1>, <1, 2> | - |
| 10 | <2, 2> | - |
| 3 | <3, 1> | - |
| 0, 1 | <0, 1>, <1, 1> | <0, 1> |
| 2, 3 | <2, 1>, <3, 1> | <1, 1> |
| 0, 1, 8, 9 | <0, 1>, <1, 1>, <0, 2>, <1, 2> | <0, 1>, <0, 2> |