### IEEE P802.11Wireless LANs

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| 11ax D3.0 MAC Comment Resolution for Control response |
| Date: 2018-08-08 |
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Abstract

This submission proposes resolutions for comments of TGax Draft D3.0 with the following CIDs:

16687, 16688 and 16689

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Identifies some of the issues with comments. Updates the resolutions.

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 D3.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D3.0 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** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 16688 | Robert Stacey | 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 with the commenter regarding power assymmetry. However, the benefit of a higher MCS when acknowledging a frame in an HE ER SU PPDU is minimal. At the low data rates available using HE ER SU PPDUs, only data-ack sequences are likely. The benefit of a higher MCS for acks is limited; efficiency is dominated by the long HE ER SU PPDU. TGax editor to make the changes shown in <this doc>.The changes retain the current rate/MCS rules for HE ER SU PPDUs but make selection of an HE ER SU PPDU for control response frame implementation dependent rather than dependent on previous use of HE ER SU PPDU in the reverse direction. |
| 16687 | Robert Stacey | 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 with the commenter.TGax editor to make the changes in <this doc>The changes essentially adopt the proposed change with additional changes that accommodate #16689 |
| 16689 | Robert Stacey | 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 with the commenter. TGax editor to make changes in <this doc>The changes remove the requirement that use of HE ER SU PPDU for control response frames is dependent on previous use of that format. Also, requirement that DCM and 106-tone RU selection are dependent on previous use of these options is removed. Instead make PPDU format selection and use of the options implementation specific. |

# Discussion

The comments identify problems with using the HE ER SU PPDU for a control response frame. In addition, the following issues need to be addressed:

* An HE ER SU PPDU is 20 MHz. Other rules require that the bandwidth of the PPDU carrying the control response be the same as the bandwidth of the soliciting PPDU.
* If the A-MPDU carrying the frame soliciting the control response frame includes a Trigger frame or if the frame soliciting the control response includes a TRS Control field, then the control response frame must be sent in an HE TB PPDU and not an HE ER SU PPDU.
* The current rules cover using HE ER SU PPDU for a control response to HE SU PPDU, but there are no rules for PPDU format selection for a control response frame sent in response to a frame in an HE MU PPDU.

The changes below address the issues identified by the commenter and the issues listed above.

There are some other multirate issues not addressed by the comment resolution in this document:

* HE ER SU PPDU options such as the use of 1x, 2x or 4x HE-LTF, 0.8 us, 1.6 us or 3.2 us GI, or the use of PE for control response frames are not addressed
* Rules for setting the TXVECTOR parameters BSS\_COLOR, TXOP\_DURATION and SPATIAL\_RESUSE apply. These rules seem complicated for a control response.
* There are no bandwidth selection rules for HE PPDUs. See paragraph 8 in 10.7.6.6.
* 10.7.6.7 needs updating

non-HT PPDU durations for Ack frame (14 octets):

12 Mb/s: 20+ceil(14/6)\*4 = 32 us

6 Mb/s: 20+ceil(14/3)\*4 = 40 us

HE ER SU PPDU durations for Ack frame (14 octets):

242-tone MCS0 no DCM no PE (8.6 Mb/s): 44+(13.6)+ceil(14/14.625)\*13.6 = 71.2 us

242-tone MCS0 DCM no PE (4.3 Mb/s): 44+13.6+ceil(14/7.25)\*13.6 = 84.8 us

106-tone MCS0 no DCM no PE (3.8 Mb/s): 44+13.6+ceil(14/6.375)\*13.6 = 98.4 us

106-tone MCS0 DCM no PE (1.8 Mb/s): 44+13.6+ceil(14/3.125)\*13.6 = 125.6 us

# Editing instructions

***TGax editor: Change 27.15.2 PPDU format selection as follows: (Track change on)***

* PPDU format selection

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 in response to an HE ER SU PPDU or HE SU PPDU that uses STBC shall be carried in the same PPDU format as the soliciting PPDU.
* A Control frame sent by the AP as a response to an HE TB 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 Trigger frame(#13317) may be carried in any PPDU format that is supported by the intended receiver(s).
* A Control frame is carried in an HE TB PPDU if it is sent as a response to a PPDU that contains a Trigger frame that is not an MU-RTS Trigger frame or if it is sent as a response to a PPDU that contains a frame containing a TRS Control subfield(#13136)(#14137) (see 27.5.3 (UL MU operation)).(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.
* (#16688)(#16688)
* A STA that sends a Control frame that is a response to a frame received in an HE SU PPDU, HE ER SU PPDU or HE MU PPDU may transmit the Control frame as an S-MPDU in an HE ER SU PPDU if the transmission is not in response to a Trigger frame or frame carrying a TRS Control field, the HE SU PPDU or HE MU PPDU carrying the soliciting frame is a 20 MHz PPDU, the HE SU PPDU or HE ER SU PPDU carrying the soliciting frame is not using STBC, and the soliciting STA has not disabled reception of HE ER SU PPDUs. Otherwise, the STA shall send the Control frame in a non-HT or non-HT duplicate PPDU.(#16688)

NOTE 1—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.

***TGax editor: Change 27.15.3 MCS, NSS, BW and DCM selection as follows: (Track change on)***

* MCS, NSS, BW and DCM selection

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)
* A STA that transmits a non-HT PPDU carrying a Control frame that is a response to a frame received in an HE SU ER PPDU shall set the rate of the non-HT PPDU to 6 Mb/s.(#16687, #16688)
* A STA that transmits an HE ER SU PPDU carrying an S-MPDU that is a control response frame shall use the <HE-MCS, NSS> tuple <MCS0, 1>. DCM may be used if the DCM Max Constellation Rx subfield in the HE PHY Capabilities Information field in the most recently received HE Capabilities element sent by the soliciting STA is greater than 0. A 106-tone RU may be used if the Partial Bandwidth Extended Range subfield in the HE PHY Capabilities Information field in the most recently received HE Capabilities element sent by the soliciting STA is 1.(#16687, #16688, #16689)
* 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).

(… existing texts …)

(#16687, #16689)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.

(… existing texts …)