IEEE P802.11
Wireless LANs

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| HE Variant HT Control – UL MU response |
| Date: 2016-06-06 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D0.1 with the following CIDs (**28CIDs**):

* 855, 1064, 1, 784, 90, 94, 654, 453, 1181, 2249, 2297, 2208, 2406, 2576, 2901, 2902, 2903, 2405, 2904, 1254, 1255, 1256, 1202, 1714, 1761, 1762, 1881, 1418

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised some of the comment resolution discussions (changes 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 (UL MU Response)

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| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 855 | Ju-Hyung Son | 14.37 | The current format of "UL MU Response scheduling" includes only the UL PPDU Length and the RU Allocation subfields. Based on these subfields, the receiving STA would send its immediate acknowledgement modulated in an MCS chosen by its rate selection algorithms. Unlike the previous non-HT/HT/VHT PPDU formats, however, the chosen MCS level cannot be signalled to the AP in the subsequent HE trigger-based PPDU. It would be burden for the AP to decode multiple immediate acknowledgement with the MCS level individually chosen by each STA. Therefore, it would be beneficial for AP to explicitly signal the MCS level in the UL MU response scheduling subfield. | Add the "MCS" subfield in Figure 9-14c.Add the following text in line 37:"The MCS subfield indicates the MCS assigned for transmitting the HE trigger-based PPDU response and is set to TBD." | Revised –Agree in principle with the comment. Since control response frames are sent at robust MCSs we propose to allocate 2 bits for this field and use the 2 LSB encoding of the HE MCSs defined in 26.3.2.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 855. |
| 1064 | Kiseon Ryu | 14.22 | Buffer Status Poll Indication needs to be added in the HE A-Control field with the control type of UL MU response scheduling | Add "Buffer Status Poll Indication" subfield in the HE A-Control field with the control type of UL MU response scheduling | Rejected –The UL MU response scheduling allocates resources for the STA to generate Ack/BA frame as responses to the soliciting PPDU. In order to explicitly solicit buffes status reports from the STAs (which is an indipendent behavior w.r.t, acknowledgement generation) the basic variant of the Trigger frame can have this indication. |
| 1 | Ahmadreza Hedayat | 14.09 | Need to clarify or specify the setting of other parameters that is required for the responding STA to initiate an UL MU PPDU when it receives this Control Information subfield. These set of parameters include MCS, DCM, BW, ... | Either specify the additional subfields or specify the rule on how the STA decides the values for these parameters. | Revised –Agree in principle with the comment. The proposed resolution is to add any necessary fields that adds flexibility if added in the UL MU response field, and specify how the remaining ones are determined by fields obtained in the DL MU PPDU that contains the UL MU Response scheduling or by default values for the parameters. The proposal is to add AP TX power, Target RSSI, and MCS in the fields. We also add the rules for the missing fields in subclause 25.2.2.2 (Rules for soliciting UL MU frames).TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1. |
| 784 | Jeongki Kim | 14.22 | "UL MU response scheduling " HE variant HT Control field has a lot of TBDs.UL MU PPDU length value, the details of RU Allocation field, and other trigger information should be decided considering the capacity of HT Control field (A-Control subfield of the HE variant HT Control field is 30 bits(Figure 9-14a). | Change the length of RU allocation from TBD to 7 bitsAdd into the Figure 9-14c the following fields and add the related texts in the subclause:LTF and CP size (1 bit), MCS (2 bits), etc. | Revised –Agree in principle with the comment. Proposed resolution accounts for most of the suggested changes (note that LTF and CP size is a common field as such either a default value or the value used in the DL MU PPDU can be used), and for consistency a size of 8 is proposed for the RU Allocation subfield.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 784. |
| 90 | Alfred Asterjadhi | 31.57 | The length of the UL MU response scheduling is TBD, the reference to the subclause where it is defined is missing. | Replace "TBD" with 0 or add any missing field and its respective description, add "See 9.2.4.6.4.2" in the last column of this row. | Revised –Agree in principle with the comment. Proposed resolution finalizes the TBDs of this subclause.TGax editor: Replace "TBD" with “26” in the third column of row identified by Conrol ID value of 1, and add "See 9.2.4.6.4.2" in the last column of this row. |
| 94 | Alfred Asterjadhi | 32.31 | A couple of TBDs here in the UL MU Resposne scheduling. Define the unit of the UL PPDU Length subfield (e.g., 11ax symbol 16us?), and what it includes in the length calculation. Same for the RU Allocation subfield, define its length and its setting. E.g, defined it as the 7 LSBs of the RU Allocation field of the Trigger frame (with the assumption that Ack/BAs are sent in the same 80MHz as the soliciting DL MU PPDU.) Also you would need at least a portion of the MCS (say 3 LSBs? of it) and some TPC parameter (e.g., Target RSSI). | As in comment. | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested changes.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 94. |
| 654 | Huizhao Wang | 14.22 | Duplicate "RU Allocation" information inside HE Varient HT Control field. The HE-SIG-B already contains the information | Remove it from "UL MU response scheduling" | Rejected –The RU Allocation contained in the HE SIG-B specifies the allocated RU that is used to carry the soliciting (A-) MPDUs rather than the responses. The RU Allocation field in the UL MU Response scheduling is providing the allocated RU for the control response frames and may not be same as that contained in the SIG-B.  |
| 453 | Daewon Lee | 14.11 | The UL MU response scheduling is intended for immediate UL MU response that carries "ACK". However, it is not clear whether this scheduling information is applicable for both BA and ACK, or just BA, or just ACK frame. Additionally, it is not clear whether data information can be also piggybacked along with "ACK" information in the UL MU response. Further details of the field format to allow STAs to correctly identify TXVECTOR of the UL MU transmission is needed. | Clarify the operation and frames that can be carried in the UL MU PPDU that is solicited by the UL MU response scheduling field. Futhermore, finalize the field format. | Revised –Agree in principle with the comment. The proposed resolution is to add any necessary fields that cannot be determined by fields obtained in the DL MU PPDU that contains the UL MU Response scheduling or by default values for the parameters. The proposal is to add AP TX power, Target RSSI, and MCS in the fields. We also add the rules for the missing fields in subclause 25.2.2.2 (Rules for soliciting UL MU frames).TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 453. |
| 1181 | Lei Huang | 14.21 | It has been agreed in the latest 11ax SFD that 8 bits are used to signal the RU allocation for each STA in per user info field of Trigger frame. So it is natural to use 8 bits to signal the RU allocation for intended STA in the HE variant HT Control field as well. | Change ""B8+X"" to ""B16""Change ""X"" to ""8""Change ""B9+X"" to ""B17""Change ""B8+X+Y"" to ""B16+Y""" | Revised –The proposed resolution is set to 8 the size of the RU allocation subfield as defined for the trigger frame. TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1181. |
| 2249 | Weimin Xing | 14.32 | UL PPDU Length field is 9bits which is different from the 12bits Lenth field in Trigger frame, we need define a rule for the responder to coverse this filed to the L-SIG Length field of the immediate acknowledgment PPDU. | add a text such as "the UL PPDU Length subfield indicates the 9bits LSB value of the L-SIG Length field of the HE trigger-based PPDU that is the response to the UL MU response scheduling." | Revised –The proposed resolution is to use the duration of the OFDM symbol to cover a wider range, and to additionally reduce the UL PPDU Length field size to gain some bits that can be used for other purposes (e.g., AP TX Power, Target RSSI, MCS). TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2249. |
| 2297 | Yasuhiko Inoue | 14.08 | TBDs in this subclause has to be determined. | Please resolve TBDs. | Revised –Agree in principle with the comment.The proposed resolution is to resolve the TBDs and define the unknowns of this subclause.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2297. |
| 2208 | Tomoko Adachi | 14.11 | The UL MU response scheduling is not explained in 25.5.2. | Add a description in 25.5.2. | Revised –Proposed resolution is to specify that the correct subclause is 25.5.2.2 (Rules for soliciting UL MU frames) where this description is currently located.We also add the rules for the missing fields in subclause 25.2.2.2 (Rules for soliciting UL MU frames) to make this subclause and 25.5.2.2 consistent.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2208. |
| 2406 | Yongho Seok | 14.31 | "The UL PPDU Length subfield indicates the length of the HE trigger-based PPDU response and is set to a nonzero value that is TBD."Speciffy the TBD condition. It shall be greater than or equal to the Minimum Fragment Size. | As per comment | Revised –Agree in principle with the comment. However there is no constraint that ties the UL PPDU length setting and the minimum fragment size as they are different features. Proposed resolution is to define the TBD in this paragraph. TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2406. |
| 2576 | Young Hoon Kwon | 14.37 | Mechanisms for the receiving STA to figure out trigger information needs to be added in the Control Information subfield. | Add indication subfield for i) CP and LTF type, ii) # of LTFs, iii) Packet Extension, iv) TX power, v) MCS, vi) Target RSSI, etc. | Revised –Agree in principle with the comment. Proposed resolution accounts for some of the suggested changes (addition of TX power, MCS, target RSSI). Regarding the other fields that are common for all STAs in that DL MU PPDU they can be either obtained from the DL MU PPDU or can have a default value.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2576. |
| 2901 | Zhou Lan | 14.21 | X bits of RU Allocation are the same as that of Per User Info in the trigger frame? | clarification needed | Revised –Agree in principle with the comment. Proposed resolution is to clarify that the X bits is equal to 8.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2901. |
| 2902 | Zhou Lan | 14.21 | UL PPDU Length has only 9 bits while the length field of Common info in the trigger has 12 bits. Clarify the difference | Make these two fields same size otherwise clarify the difference | Revised –Agree in principle with the comment that we need to clarify the difference. In order to gain some bits to use for other signaling we propose to have the UL PPDU Length equal to 5 bits and specify that its value is in units of OFDM symbols.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2902. |
| 2903 | Zhou Lan | 14.22 | UL MU response scheduling Control Info subfield doesn't have SS allocation field. Clarify if spatical stream is not allowed in this case | Add SS allocation field otherwise clarify if MU MIMO is not allowed in this case | Revised –According to the SFD this field provides UL MU response allocation for transmitting Ack/BA frames in OFDMA. As such MU MIMO is not allowed. Proposed resolution specifies this detail in the normative portion of the spec.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2903. |
| 2405 | Yongho Seok | 14.31 | Please specify the unit of the UL PPDU Length subfield (e.g., in octets, in microseconds). | As per comment | Revised –Agree in principle with the comment. Proposed resolution clarifies the unit in symbols.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2405. |
| 2904 | Zhou Lan | 14.09 | Clarify how HE vairant of UL MU response scheduling will be used if trigger frame with RU and SS allocation info carried | Clarification needed | Revised –Agree in principle with the comment that clarifications are needed. These clarificaitons are added in subclaue 25.2.2.2.. TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 2904. |
| 1254 | Mark RISON | 14.24 | What are X and Y? | Change to numbers | Revised –Agree with the comment. Proposed resolution changes those incognitas in numbers.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1254. |
| 1255 | Mark RISON | 14.12 | "scheduling information for an HE trigger-based PPDU that carries an immediate acknowledgment, which is sent as a response to the soliciting A-MPDU (see 25.5.2 (UL MU operation))." -- why does the HETBPPDU have to carry an immediate ack? What is an "immediate acknowledgement" anyway? | Delete "that carries an immediate acknowledgement" | Revised – The UL MU Response Scheduling subfield is carried In QoS Data frames sent in a DL MU PPDU and provides necessary signaling for the receiving sta to determine the resources it can use for sending its immediate response (Ack frame if the DL MU PPDU contained a VHT signle MPDU, BA frame if it contained an A-MPDU, Multi-STA BA frame if it contained a multi-TID A-MPDU and so on). For all other purposes the Trigger frame can be used.Also please note that this terminology is used consistently in the baseline (well acknowledgment instead of acknoweldgement, fixing the typo in the text).Proposed resolution is to fix the typo in “acknowledgement”.TGax editor to replace acknowledgement with acknowledgment” throughout the draft. |
| 1256 | Mark RISON | 14.10 | "scheduling information for an HE trigger-based PPDU that carries an immediate acknowledgment, which is sent as a response to the soliciting A-MPDU (see 25.5.2 (UL MU operation))." is confusing | Change to "scheduling information for an HE trigger-based PPDU that follows the HE MU PPDU containing the Control Information subfield after SIFS (see 25.5.2)" | Revised –Agree in principle with the comment. Proposed resolution takes into account the suggested change, noting that this solicitation is only allowed for immediate responses. TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1256. |
| 1202 | Liwen Chu | 14.09 | some fields in UL MU response scheduling info are still missing. | Add 8-bit RU allocation and 6 bit TX power. | Revised –Agree in principle with the comment. Proposed resolution is to add 8 bits of RU Allocation and 5 bits of TX Power.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1202. |
| 1714 | Osama Aboulmagd | 14.31 | What units are used for the Length of the UL PPDU? | as in comment | Revised –Proposed resolution clarifies the duration of the UL PPDU Length as determined by this field’s value. TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1714. |
| 1761 | Po-Kai Huang | 13.05 | The RU allocation format in Trigger Frame has already been decided in March TGax. The RU allocation in UL MU response scheduling of HE control should follow the same format. | Propose to use the same signaling and number of bits defined in RU allocation of Per-User Info field in Trigger frame for RU allocation in UL MU response scheduling of HE control. | Revised –Agree in principle with the comment. Proposed resolution is to use the same signaling..TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1761. |
| 1762 | Po-Kai Huang | 13.02 | Similar to the length field defined in the common field of Trigger frame, the UL PPDU length should indicates the length in the L-SIG of HE trigger-based PPDU response. | Propose the following changes. Change the length of UL PPDU field to 12 bits and modify the following sentence. "The UL PPDU Length subfield indicates the value of the L-SIG Length field of the HE trigger-based PPDU response." Remove "the length of the HE trigger-" | Revised –The proposed change would increase the length of the field to 12 bits, extra 3 bits that can be used for other parameters. In order to allocate more bits for other parameters the proposed resolution is to have the field 5 bits and with units of OFDM symbols.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1762. |
| 1881 | Sigurd Schelstraete | 14.25 | Several TBDs and unknowns in section 9.2.4.6.4.2 | See lines 25 (X,Y), 32, 36 (TBD) | Revised –Agree in principle with the comment (assuming that the comment is indicating that we need to resolve these TBDs).The proposed resolution is to resolve the TBDs and define the unknowns of this subclause.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1881. |
| 1418 | Mark RISON |  | Why are there two trigger mechanisms (TF and HE variant HT Control)? What if both features are used simultaneously? | Use a single mechanism for triggering | Revised –Compared to the use of the Trigger frame, the use of UL MU Response Scheduling A-Control field increases robustness since the A-Control field is present in every MPDU of the A-MPDU and reduces the overhead in low BW/RUs and limited number of soliciting MPDUs in the A-MPDU. Please refer to <https://mentor.ieee.org/802.11/dcn/16/11-16-0643-00-00ax-he-control-scheduling.pptx> for more information regarding the benefits of the feature.Agree in principle that some clarifications are needed when both features are used simultaneously. The proposed resolution provides such clarifications.TGax editor to make the changes shown in 11-16/0766r1 under all headings that include CID 1418. |

**Discussion:** This document also includes motions passed during the IEEE F2F meeting in May: <https://mentor.ieee.org/802.11/dcn/16/11-16-0643-00-00ax-he-control-scheduling.pptx>

**9.2.4.6.4.2 UL MU response scheduling**

**TGax Editor: *Change the paragraphs below as follows (#CID 2208, 1256):***

The Control Information subfield, when the Control ID subfield is 0, contains scheduling information for an HE trigger-based PPDU that carries an immediate acknowledgment and follows the HE MU PPDU containing the Control information subfield(see 25.5.2.2 (Rules for soliciting UL MU frames)).

The format of the Control Information subfield is defined in Figure 9-14c (Control Information subfield format when Control ID subfield is 0).

 **TGax Editor: *Change the figure below (#CID 1, 90, 94, 855, 784, 453, 1254, 1181, 2249, 2297, 2576, 1881, 1202):***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 B4 | B5 B12 | B13 B17 | B18 B22 | B23 B24 | B25 |
|  | UL PPDU Length | RU Allocation |  DL TX Power | UL Target RSSI | UL MCS | Reserved |
| Bits: | 5 | 8 | 5 | 5 | 2 | 1 |

**Figure 9‑14c - Control Information subfield format when Control ID subfield is 0**

**TGax Editor: *Insert a new paragraph as follows (#CID 94, 2249, 2406, 2902, 2405, 1762, 1714):***

The UL PPDU Length subfield indicates the length of the HE trigger-based PPDU response and is set to the number of OFDM symbols, *NSYM*, (minus one) of the Data field of the PPDU. The duration of the HE trigger-based PPDU is calculated as defined in 26.4.3 (TXTIME and PSDU\_LENGTH calculation).

**TGax Editor: *Change the paragraph below and insert new paragraphs as follows (#CID 1, 784, 453, 94, 1181, 2576, 2901, 1202, 1761, 1202):***

The RU Allocation subfield indicates the resource unit (RU) assigned for transmitting the HE trigger-based PPDU response and is defined in 9.3.1.23 (Trigger frame format).

The DL TX Power subfield indicates the AP transmit power, combined over all TX antennas and averaged in 20 MHz BW, used for the soliciting frame, in units of dBm. The transmit power, *PTX*, is calculated as *PTX* = –20 + 2×*FVal*, where *FVal* is the value of the DL TX Power subfield, except for the value 31, which is reserved.

The UL Target RSSI subfield indicates the AP target receive power, i.e., averaged RSSI over all AP’s antennas, for the responding STA when transmitting the HE trigger-based PPDU, in units of dBm. The target receive power, *TRSSI*, is calculated as *TRSSI* = –90 + 2×*FVal*, except for the value 31 that indicates to the STA to transmit at maximum power for the assigned MCS.

NOTE—It is possible that a STA can not satisfy the target RSSI due to its hardware or regulatory limitation.

**TGax Editor: *Insert a new paragraph as follows (#CID 1, 855, 784, 94, 453):***

The UL MCS subfield indicates the MCS, from MCS0 to MCS3, to be used by the receiving STA for the HE trigger-based PPDU (see 26.5.1 (Parameters for HE-MCSs)).

**25.5.2 UL MU operation**

**25.5.2.1 General**

The UL MU operation allows an AP to solicit immediate simultaneous response frames from one or more non-AP STAs. Non-AP STAs transmit their response frames in HE trigger-based PPDU format, in either UL MU OFDMA UL MU-MIMO, or both.

An HE STA with dot11ULMUOFDMAOptionImplemented set to true shall set the UL MU OFDMA Capable subfield of the HE Capabilities element it transmits to 1; otherwise, the STA shall set it to 0.

An HE STA with dot11ULMUMIMOOptionImplemented set to true shall set the UL MU MIMO Capable subfield of the HE Capabilities element it transmits to 1; otherwise, the STA shall set it to 0.

A non-AP STA with dot11ULMUOFDMAOptionImplemented or dot11ULMUMIMOOptionImplemented equal to true is referred to as an UL MU capable STA.

**TGax Editor: *Change the subclauses below as follows (#CID Misc):***

An HE STA shall set the UL MU Response Scheduling Support subfield of the HE Capabilities element it transmits to 1 if its dot11HEULMUResponseSchedulingOptionImplemented is true; otherwise the STA shall set it to 0.**25.5.2.2 Rules for soliciting UL MU frames**

**TGax Editor: *Change the subclauses below as follows (#CID 1, 453, 855, 784, 94, 1181, 2249, 2208, 2576, 2902, 2903, 2904, 1418):***

**25.5.2.2.1 General**

An AP shall not send to a STA a frame soliciting the transmission of a PPDU with the TXVECTOR parameter FORMAT set to HE\_TRIG, unless the STA is UL MU Capable.

An AP shall not send to a STA an MPDU that contains an UL MU Response Scheduling A-Control subfield, unless the STA has set the UL MU Response Scheduling Support subfield to 1 in the HE Capabilities element it transmits.

An AP may transmit a PPDU that elicits an HE trigger-based PPDU from one or more UL MU capable STAs by including in the PPDU at least one of:

* A Trigger frame that includes one or more per-User Info field addressed to the recipient STA(s).
	+ For recipient STAs that are associated with the AP, the per-User Info field is addressed to a recip­ient STA if the value of the AID subfield of the Per-User Info field is equal to the AID of the STA.
	+ For recipient STAs that are not associated with the AP, TBD
* An UL MU Response Scheduling A-Control subfield of individually addressed MPDU(s) contained in the DL MU PPDU that:
	+ Are carried in a VHT single MPDU format that solicits an immediate Ack frame (see 10.13.8 (Transport of VHT single MPDUs))
	+ Are carried in an A-MPDU format that solicits an immediate BlockAck frame (see 10.24.7.7 (Originator’s behavior))
	+ Are carried in a multi-TID A-MPDU format that solicits an immediate Multi-STA BA frame (see 25.10.3 (A-MPDU with multiple TIDs))

NOTE—The AP additionally follows the rules defined in 25.3.2 (Procedure at the originator) when fragments are present in the generated MPDU(s).

The following two frames shall not be present at the same time in an A-MPDU

* A Trigger frame with a Per User Info field addressed to a STA
* An MPDU addressed to a STA that contains an UL MU Response Scheduling A-Control subfield

If a Trigger frame is aggregated with other frames in an A-MPDU, the Trigger frame shall be the first frame in the A-MPDU.

**25.5.2.3 STA behavior**

A STA shall not transmit an HE trigger-based PPDU unless it is explicitly enabled by an AP in one of the operation modes described in this section.

The inter frame space between a PPDU that contains a Trigger frame and the triggered HE trigger-based PPDU is SIFS.

A STA shall commence the transmission of an HE trigger-based PPDU at the SIFS time boundary after the end of a received PPDU, when all the following conditions are met

* The received PPDU contains either a Trigger Frame with a Per User Info field addressed to the STA, or an MPDU addressed to the STA that contains an UL MU Response Scheduling A-Control subfield, but not both .
	+ The Per User Info field is addressed to a STA if the AID subfield is equal to the AID of the STA, if the STA is associated with the AP. If the STA is not associated with the AP, TBD.
* The UL MU CS Condition described in 25.5.2.4 (UL MU CS mechanism) indicates the medium is idle, or the CS Required subfield in a Trigger frame is 0.

A STA transmitting an HE trigger-based PPDU in response to a Trigger frame shall set the TXVECTOR parameter as follows:

* The L\_LENGTH parameter shall be set to the value indicated by the L-SIG Length field of the eliciting Trigger frame.
* The CP\_LTF\_TYPE parameter shall be set to the value indicated by the CP-LTF subfield of the Common Info field of the eliciting Trigger frame
* The SIG-A\_CONT parameter shall be set to the value indicated by the SIG-A subfield of the Common Info field of the eliciting Trigger frame [TBD, depending on how the TXVECTOR is defined we may spell out all the subfields of SIG-A]
* The DCM parameter shall be set to the value indicated by the DCM subfield of the per-User Info field of the eliciting Trigger frame
* The CODING\_TYPE parameter shall be set to the value indicated by the Coding Type subfield of the Per User Info field of the eliciting Trigger frame
* The RU parameter shall be set to the value indicated by the RU Allocation field of the trigger frame
* The NSTS parameter shall be set to TBD

A STA transmitting an HE trigger-based PPDU in response to soliciting MPDU(s), containing an UL MU Response Scheduling A-Control subfield, shall set the TXVECTOR parameters as follows:

* *NSYM* shall be set to the *FVAL* + 1, where *FVAL* is the value of the UL PPDU Length subfield of the UL MU Response Scheduling subfield
* UL\_TARGET\_RSSI, DL\_TX\_POWER, RU\_ALLOCATION, and MCS parameters shall be set to the values of UL Target RSSI, DL TX Power, RU Allocation, and UL MCS subfields of the UL MU Response Scheduling subfield, respectively.
* BW shall be equal to the bandwidth of the soliciting DL MU PPDU
* BSS\_COLOR, and DCM shall be set to the values of the RXVECTOR parameters BSS\_COLOR, and DCM of the soliciting DL MU PPDU, respectively
* MU\_MIMO\_LTF\_MODE, LDPC\_EXTRA, NSTS, STBC, CODING TYPE, SS\_ALLOCATION shall all be set to 0
* SPATIAL\_REUSE shall be set to the value indicating SR\_Disallowed
* PE\_DURATION shall be set to the default PE duration value for UL MU response scheduling, which is indicated by the AP in the Default\_PE Duration subfield of the HE Operation element it transmits, and the *a-factor* shall be set to 4 (see 26.3.10.15 (Packet extension))
* TXOP\_DURATION parameter shall be set according the rules defined in 25.2.1 (Updating two NAVs)
* CP\_LTF\_TYPE parameter shall be set to indicate 4x LTF + 3.2μs CP if the RXVECTOR parameter CP\_LTF\_TYPE is 4x LTF + 3.2μs CP or 2x LTF + 1.6 μs CP ; otherwise shall be set to indicate 2x LTF + 1.6μs CP

NOTE 1—The Trigger-based PPDU in this case is only sent in UL OFDMA format and CS is not required prior to its transmission (see 25.5.2.4 (UL MU CS mechanism)).

NOTE 2—The use of BCC limits the available RU sizes as defined in 26.3.10.7 (BCC Interleavers).

The STA that responds to a DL MU PPDU containing MPDU(s) addressed to it that include UL MU Response Scheduling A-Control subfield(s) follows the rules defined in 10.3.2.9 (Ack procedure) for generating the Ack frame, the rules defined in 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG STA) for generating the BlockAck frame, and the rules defined in 25.4 (Block acknowledgement) for generating the Multi-STA BlockAck frame.

NOTE—The STA additionally follows the rules defined in 25.3.3 (Procedure at the receiver) when fragments are present in the soliciting (A-) MPDU(s).

The MAC padding procedure is descried in 10.42.2.1.2

The content of each individual A-MPDU in an HE MU PPDU is based on the rules specified in 10.13.1 (A-MPDU contents) and the additional rules described in this clause.

If the Trigger Type value of a Trigger frame is not equal to 0, the STA shall include in the reponse A-MPDU at least one MPDU of the required type. If the STA does not have a frame of the required type, the STA should transmit QoS Null frame.

NOTE--The frame type of MPDUs may be different across A-MPDUs within a same HE trigger-based PPPDU

**TGax Editor: *Change the subclauses below as follows:***

## 10.9 HT Control field operation

If the value of dot11HTControlFieldSupported is true, a STA shall set the +HTC Support subfield of the HT Extended Capabilities field of the HT Capabilities element to 1 in HT Capabilities elements that it transmits. If the value of dot11VHTControlFieldOptionImplemented is true, a STA shall set the +HTC-VHT Support subfield of the VHT Capabilities Information field(#6472) of the VHT Capabilities element to 1 in VHT Capabilities elements that it transmits. If the value of the dot11HEControlFieldOptionImplemented is true, a STA shall set the +HTC-HE Support subfield of the HE Capabilies Information field of the HE Capabilities element to 1(11ac) in HE Capabilities elements that it transmits.

A STA that has a value of true for at least one of dot11RDResponderOptionImplemented, dot11MCSFeedbackOptionImplemented, and dot11AlternateEDCAActivated(#1054)(11aa) shall set dot11HTControlFieldSupported or dot11VHTControlFieldOptionImplemented or both(11ac) to true. A STA that has a value of true for at least one of dot11HEULMUResponseSchedulingOptionImplemented, dot11MCSFeedbackOptionImplemented, and dot11ROMIOptionImplemented shall set the dot11HEControlFieldOptionImplemented to true.

An HT variant(11ac) HT Control field shall not be present in a frame addressed to a STA unless that STA declares support for +HTC-HT(11ac) in the HT Extended Capabilities field of its HT Capabilities element (see 9.4.2.55 (HT Capabilities element)).

A VHT variant HT Control field shall not be present in a frame addressed to a STA unless that STA declares support for +HTC-VHT in the VHT Capabilities Information field(#6472) of its VHT Capabilities element.(11ac)

NOTE—An HT STA that does not support +HTC (HT or VHT variant)(11ac) that receives a +HTC frame addressed to another STA still performs the CRC on the actual length of the MPDU and uses the Duration/ID field to update the NAV, as described in **Error! Reference source not found.**.

An HE variant HT Control field shall not be present in a frame addressed to a STA unless that STA declares support for +HTC-HE in the HE Capabilities Information field of its HE Capabilities element. The HE variant HT Control field carried in the frame may contain a Control subfield supported by the intended receiver that has:

* A value of 0 in the Control ID subfield when the transmitting STA expects an HE trigger-based PPDU that carries an immediate acknowledgement, as described in 25.5.2 (UL MU operation).
* A value of 1 in the Control ID subfield when the transmitting STA changes the receive operation mode, as described in 10.45.2 (Receive operating mode indication).
* A value of 2 in the Control ID subfield when the transmitting STA follows the HE link adaptation procedure, as described in 10.31.4 (Link adaptation using the HE variant HT Control field).
* ...

If the HT Control field is present in an MPDU aggregated in an A‑MPDU, then all MPDUs of the same frame type (i.e., having the same value for the Type subfield of the Frame Control field) aggregated in the same A‑MPDU shall contain an HT Control field. The HT Control field of all MPDUs containing the HT Control field aggregated in the same A‑MPDU shall be set to the same value.

**9.4.2.213 HE Capabilities element**

**TGax Editor: *Insert a “UL MU Response Scheduling Support” bit in Figure 9-554b (HE Capabilities element)***

**TGax Editor: *Insert a new paragraph at the end of this subclause as follows:***

The UL MU Response Scheduling Support subfield indicates support for receiving an (A-) MPDU that contains an UL MU Response Scheduling A-Control subfield. The UL MU Response Scheduling Support subfield is set to 1 when the STA supports the reception of the UL MU Response Scheduling subfield; otherwise it is set to 0.

**9.4.2.214 HE Operation element**

**TGax Editor: *Insert a 3 bit “Default PE Duration” field in Figure 9-ax6 (HE Operation Parameter field format)***

**TGax Editor: *Insert a new paragraph at the end of this subclause as follows:***

The Default PE Duration subfield indicates the value of the PE duration, in units of 4 μs, for a Trigger-based PPDU that is solicited with UL MU Response Scheduling in the A-Control subfield. Values 5-7 of the Default PE Duration subfield are reserved.