IEEE P802.11  
Wireless LANs

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| CR for 35.4.2 UL MU operation | | | | |
| Date: Apr. 15, 2021 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Jason Yuchen Guo | Huawei |  |  | guoyuchen@huawei.com |
| Ming Gan | Huawei |  |  |  |
| Yunbo Li | Huawei |  |  |  |
| Guogang Huang | Huawei |  |  |  |
| Yiqing Li | Huawei |  |  |  |
| Mengyao Ma | Huawei |  |  |  |
| Hongjia Su | Huawei |  |  |  |
| Youhan Kim | Qualcomm |  |  |  |

Abstract

This submission proposes resolutions for following CID received for TGbe CC34:

1088

Revisions:

* Rev 0: Initial version of the document.
* Rev 1-2: update the text based on D1.0
* Rev 3: updates based on offline feedback from Youhan, the major changes are
  + Create a new subclause as 26.5.2.2.1a Additional rules for soliciting UL MU frames, and put the rules that are unique to HE UL MU into this new subclause.
  + For AP behaviour, create corresponding subclauses same as 11ax, and clarify how the rules defined in 11ax are applied for EHT TB PPDU.
  + Define padding rules for the triggering frame when the triggering frame is the initial control frame in the eMLSR/eMLMR mode.

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 TGbe Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGbe Editor: Editing instructions preceded by “TGbe Editor” are instructions to the TGbe editor to modify existing material in the TGbe draft. As a result of adopting the changes, the TGbe editor will execute the instructions rather than copy them to the TGbe Draft.***

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| **CID** | **Commenter** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 1088 | Alfred Asterjadhi | 146.42 | 35.4 | Several subclauses for UL MU operation are missing. Several things need to be expanded in this case, such as support for EHT TB PPDU, 320 MHz, up to 16 SS, and other new PHY functionalities that are added to the PHY subclauses. Add necessary capability bits and MIB variables. | As in comment | Revised-  Agree with the comment. Inherit the rules defined in 26.5.2 (HE UL MU operation) that can also be applied to EHT UL MU operation. Define some new rules to support EHT UL MU operation.  TGbe editor: Please implement changes as shown in this document. |

***TGbe editor: Please note baselines are REVme D0.1, 11ax-2021 and 11be D1.01***

**26.5.2.2 Rules for soliciting UL MU frames**

**26.5.2.2.1 General**

*Delete the first five paragraphs of 26.5.2.2.1:*

~~An HE AP shall not allocate an RU for a 40 MHz HE TB PPDU to a 20 MHz operating non-AP HE STA in the 2.4 GHz band, unless the AP has received from the 20 MHz operating non-AP HE STA an HE Capabilities element with the 20 MHz In 40 MHz HE PPDU In 2.4 GHz Band subfield in the HE PHY Capabilities Information field in its HE Capabilities element equal to 1.~~

~~An HE AP shall not allocate an RU for an 160 MHz or 80+80 MHz HE TB PPDU to a 20 MHz operating non-AP HE STA, unless the AP has received from the 20 MHz operating non-AP HE STA an HE Capabilities element with the 20 MHz In 160/80+80 MHz HE PPDU in the HE PHY Capabilities Information field equal to 1.~~

~~An AP shall not allocate to a 20 MHz operating non-AP HE STA a 242-tone RU for a 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz HE TB PPDU transmission.~~

~~An AP shall not transmit a Trigger frame soliciting an HE TB PPDU that uses UL MU-MIMO within an RU that does not span the entire PPDU bandwidth to a non-AP STA from which it has not received an HE Capabilities element with the Partial Bandwidth UL MU-MIMO subfield of the HE PHY Capabilities Information field equal to 1.~~

~~An AP shall not transmit a Trigger frame soliciting an HE TB PPDU that uses UL MU-MIMO within an RU that spans the full bandwidth to a non-AP STA from which it has not received an HE Capabilities element with the Full Bandwidth UL MU-MIMO subfield of the HE PHY Capabilities Information field equal to 1.~~

*Delete the seventh paragraph of 26.5.2.2.1:*

~~An AP shall not send a frame that carries a TRS Control subfield that allocates a 2×996-tone RU to a nonAP STA or a Trigger frame with a User Info field that allocates a 2×996-tone RU to a non-AP STA, unless the AP has received from the non-AP STA an HE MAC Capabilities element with the UL 2×996-tone RU Support subfield in the MAC Capabilities Information field equal to 1.~~

*Insert the following text after 26.5.2.2.1:*

**26.5.2.2.1a Additional rules for soliciting UL MU frames**

An HE AP shall not allocate an RU for a 40 MHz HE TB PPDU to a 20 MHz operating non-AP HE STA in the 2.4 GHz band, unless the AP has received from the 20 MHz operating non-AP HE STA an HE Capabilities element with the 20 MHz In 40 MHz HE PPDU In 2.4 GHz Band subfield in the HE PHY Capabilities Information field in its HE Capabilities element equal to 1.

An HE AP shall not allocate an RU for an 160 MHz or 80+80 MHz HE TB PPDU to a 20 MHz operating non-AP HE STA, unless the AP has received from the 20 MHz operating non-AP HE STA an HE Capabilities element with the 20 MHz In 160/80+80 MHz HE PPDU in the HE PHY Capabilities Information field equal to 1.

An AP shall not allocate to a 20 MHz operating non-AP HE STA a 242-tone RU for a 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz HE TB PPDU transmission.

An AP shall not transmit a Trigger frame soliciting an HE TB PPDU that uses UL MU-MIMO within an RU that does not span the entire PPDU bandwidth to a non-AP STA from which it has not received an HE Capabilities element with the Partial Bandwidth UL MU-MIMO subfield of the HE PHY Capabilities Information field equal to 1.

An AP shall not transmit a Trigger frame soliciting an HE TB PPDU that uses UL MU-MIMO within an RU that spans the full bandwidth to a non-AP STA from which it has not received an HE Capabilities element with the Full Bandwidth UL MU-MIMO subfield of the HE PHY Capabilities Information field equal to 1.

An AP shall not send a frame that carries a TRS Control subfield that allocates a 2×996-tone RU to a non-AP STA or a Trigger frame with a User Info field that allocates a 2×996-tone RU to a non-AP STA, unless the AP has received from the non-AP STA an HE MAC Capabilities element with the UL 2×996-tone RU Support subfield in the MAC Capabilities Information field equal to 1.

**35.4.2 EHT UL MU operation**

***TGbe editor: Please update the subclause as shown below***

**35.4.2.1 General**

EHT UL MU operation allows an AP to solicit simultaneous immediate response frames from one or more non-AP EHT STAs. EHT UL MU operation expands the UL MU functionalities inherited from HE with the additional capability of responding with EHT TB PPDUs, with bandwidths up to 320 MHz.

An EHT STA that is a mesh STA shall not transmit or receive EHT TB PPDUs.

An EHT STA with dot11EHTPartialBWULMUMIMOImplemented equal to true shall set the Partial Bandwidth UL MU-MIMO subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits to 1. An EHT STA with dot11EHTPartialBWULMUMIMOImplemented equal to false shall set the Partial Bandwidth UL MU-MIMO subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits to 0.

An EHT AP shall not transmit a triggering frame in the 6 GHz band which allocates an RU/MRU that occupies the secondary 160 MHz channel to a non-AP EHT STA, unless the AP has received from the non-AP EHT STA an EHT Capabilities element with the Support For 320 MHz In 6 GHz subfield in the EHT PHY Capabilities Information field equal to 1 and the non-AP EHT STA is in 320 MHz operating bandwidth.

A non-AP EHT STA with dot11HEDeviceClass equal to ClassA shall meet the Class A requirements specified in 36.3.16 when transmitting an EHT TB, non-HT or non-HT Duplicate PPDU in response to a triggering frame. A non-AP EHT STA with dot11HEDeviceClass equal to ClassB shall meet the Class B requirements specified in 36.3.16 when transmitting an EHT TB, non-HT or non-HT Duplicate PPDU in response to a triggering frame.

NOTE – A non-AP EHT STA uses the Device Class subfield in the HE PHY Capabilities Information field in the HE Capabilities element it transmits to indicate its device class based on dot11HEDeviceClass. See 26.5.2.1.

**35.4.2.2 Rules for soliciting UL MU frames**

**35.4.2.2.1 General**

An EHT STA shall follow the rules defined in 26.5.2.2.1, where

* Rules related to HE STAs also apply to EHT STAs.
* Rules related to triggering frames also apply to triggering frames soliciting EHT TB PPDUs.
* Rules related to HE MU and HE TB PPDUs also apply to EHT MU and EHT TB PPDUs, respectively.

An EHT AP shall not transmit a Trigger frame soliciting an OFDMA EHT TB PPDU that uses UL MU-MIMO within an RU/MRU to a non-AP EHT STA from which the AP has not received an EHT Capabilities element with the Partial Bandwidth UL MU-MIMO subfield of the EHT PHY Capabilities Information field equal to 1.

An AP shall follow the RU/MRU restriction rules defined in 36.3.2.6 when assigning an RU/MRU to a 20 MHz operating non-AP STA for a 40 MHz, 80 MHz, 160 MHz, or 320 MHz EHT TB PPDU. An AP shall follow the rules defined in 36.3.2.5, 36.3.2.7 and 36.3.2.8 when assigning an RU/MRU to a non-AP EHT STA whose operating bandwidth is smaller than the BSS operating channel width.

**35.4.2.2.2 Requirements for allocating resources**

An EHT AP shall follow the requirements for allocating resources specified in 26.5.2.2.2 where rules related to HE STAs also apply to EHT STAs, and rules related to HE TB PPDUs also apply to EHT TB PPDUs, except that the negotiation of block ack bitmap lengths is additionally defined in 35.3.7.2.2.

**35.4.2.2.3 Padding for a triggering frame**

An EHT AP shall ensure that there is sufficient padding in a triggering frame as specified in 26.5.2.2.3 if the triggering frame is neither an initial Control frame of a frame exchange sequence with a non-AP MLD operating in the EMLSR mode, nor an initial frame of a frame exchange sequence with a non-AP MLD operating in the EMLMR mode.

When an EHT AP of an AP MLD transmits an initial Control frame to initiate a frame exchange with a non-AP MLD operating in EMLSR mode, the AP shall ensure that the number of bits in the PSDU following the last bit of User Info field addressed to the non-AP MLD is at least *LPAD,MAC* defined in Equation (35-x1).

 (35-x1)

where



*EMLSR\_DELAY* is value of the EMLSR Delay subfield in the EML Capabilities subfield in the Multi-Link element

*NDBPS* is defined in Table 17-4.

NOTE – The initial Control frame of a frame exchange sequence to initiate a frame exchange with a non-AP MLD operating in EMLSR mode is sent using the non-HT or non-HT duplicate PPDU.

When an EHT AP of an AP MLD transmits a triggering frame using non-HT or non-HT duplicate PPDU as an initial frame to initiate a frame exchange with a non-AP MLD operating in EMLMR mode, the AP shall ensure that the number of bits in the PSDU following the last bit of User Info field addressed to the non-AP MLD is at least *LPAD,MAC* defined in Equation (35-x1).

where



*EMLMR\_DELAY* is value of the EMLMR Delay subfield in the EML Capabilities subfield in the Multi-Link element

*NDBPS* is defined in Table 17-4.

NOTE – The initial frame of a frame exchange sequence to initiate a frame exchange with a non-AP MLD operating in EMLMR mode can be sent using the non-HT PPDU, non-HT duplicate PPDU, HT PPDU, VHT PPDU, HE PPDU or EHT PPDU. However, for HT PPDU, VHT PPDU, HE PPDU or EHT PPDU, there are other methods to do the padding for the initial frame, so the above padding method only applies to the case where the initial frame is sent using non-HT or non-HT duplicate PPDU.

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

An EHT AP may transmit a Trigger frame that solicits an EHT TB PPDU from an EHT STA subject to the rules defined in 26.5.2.2 (Rules for soliciting UL MU frames) and the additional rules defined below.If the dot11EHTBaseLineFeaturesImplementedOnly is equal to true then an EHT AP shall not transmit a Trigger frame that solicits both an HE TB PPDU and an EHT TB PPDU.

The AID12 subfield of the Special User Info field shall be set to 2007. An EHT AP that includes the Special User Info field in a Trigger frame shall set Special User Info Field Present subfield to 0 and the special User Info field shall be placed immediately after the Common Info field. An EHT AP shall set the value of B54 in the Common Info field of a Trigger frame to 1 if there exists any HE variant User Info field in the Trigger frame. Otherwise, the EHT AP shall set the value of B54 in the Common Info field of the Trigger frame to 0.

An EHT AP shall not assign an AID value of 2007 to any STA.

An EHT AP shall set the UL Length subfield of a transmitted Trigger frame that solicits an EHT TB PPDU to the value given by Equation (27-11) with m = 2.

NOTE—This is the same rule as that of an AP that transmits a Trigger frame that solicits an HE TB PPDU (see 26.5.2.2.4 (Allowed settings of the Trigger frame fields and TRS Control field)).

**35.4.2.2.5 AP access procedures for UL MU operation**

An EHT AP shall follow the AP access procedures for UL MU operation as specified in 26.5.2.2.5.

**35.4.2.3 Non-AP STA behavior for UL MU operation**

**35.4.2.3.1 General**

A non-AP EHT STA that transmits a TB PPDU shall satisfy the conditions defined in 26.5.2.3.1, 26.5.2.3.2, 26.5.2.3.5 and 26.5.2.4 where rules related to HE TB PPDUs also apply to EHT TB PPDUs. A User Info field that is addressed to a non-AP STA is either an HE variant or EHT variant. The User Info field is an HE variant addressed to a non-AP STA if the B39 of the User Info field is set to 0 and the B54 of the Common Info field is set to 1 in the Trigger frame; otherwise, it is an EHT variant.

If a non-AP EHT STA receives an EHT variant User Info field in a Trigger frame which is not MU-RTS Trigger frame in which the AID12 subfield matches its AID, then it responds with an EHT TB PPDU. If an EHT non-AP STA receives an HE variant User Info field in a Trigger frame which is not MU-RTS Trigger frame in which the AID12 subfield matches its AID, then it responds with an HE TB PPDU.

A non-AP EHT STA shall not send an EHT TB PPDU unless it is explicitly triggered by an AP in one of the operation modes described in 26.5.2.3 (Non-AP STA behavior for UL MU operation) and the operation modes described in 35.4.2.3.2 (TXVECTOR parameters for EHT TB PPDU response to Trigger frame).

A non-AP EHT STA shall not send an HE TB PPDU on the secondary 160 MHz.

**35.4.2.3.2 TXVECTOR parameters for EHT TB PPDU response to Trigger frame**

**Straw Poll: Do you support the changes proposed in 11-21/0662r3 for the following CID?**

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**Result: Yes/No/Abstain**