IEEE P802.11  
Wireless LANs

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| PDT-MAC-UHR-MU-operation | | | | |
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**Abstract**

This document contains Proposed Draft Text (PDT) for the UHR MU operation feature of the proposed 11bn/UHR amendment to the 802.11 standard. This PDT also addresses 4 CIDs 1200, 1619, 1632 and 3275 of TGbn Draft 0.1

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Two more CIDs that can be resolved have been added
* Rev 2: Some minor changes

**Introduction**

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 TGbn Draft. The abstract, revision information, introduction, explanation of the proposed changes and references sections are not part of the adopted material.

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

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

**Relevant passing motions:**

[Motion #196]

**Move to add to the TGbn SFD the following:**

* MU-MIMO+OFDMA in both DL and UL is limited to UHR PPDU of 160 and 320MHz only
  + 160MHz PPDU – 996 and, when the PPDU is punctured, 484+242
  + 320 MHz PPDU: 2x996, 3x996 and, when the PPDU is punctured, 996+484, 2x996+484
* MU-MIMO+OFDMA is further limited to a maximum of 2RUs supporting MU-MIMO and each 80MHz segment is either MU-MIMO or OFDMA
* RU Allocation table in UHR-SIG is the same as that in EHT-SIG except that the rows for RU 242, 484 and 3x996+484 with two or more users are changed to Validate

**CIDs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **PP.LL** | **Comment** | **Proposed Change** | **Resolution** |
| 1200 | 9.3.1.22.6 | 47.61 | In DL OFDMA+MU-MIMO, the limitation of the size of RUs for this transmission was defined. to align with DL OFDMA+MU-MIMO, this limitation can be applied to UL MU-MIMO in TB PPDU transmission. Define the size of RU for UL-MU-MIMO in TB PPDU, and add the description for this. | Add the description for UL MU-MIMO in TB PPDU and RU restriction. | Revised.  This is addressed in subclause 38.3.3.1, which is proposed in PDT 11-25/701r2  **TGbn editor, please make the changes tagged by CID #1200.** |
| 1619 | 38.3.3 | 109.31 | Define 37.x.y (RU allocation in a UHR MU PPDU), | as in comment | Revised.  Agree with the commenter. The subclause “RU allocation in a UHR MU PPDU” is added  **TGbn editor, please make the changes tagged by CID #1619 in this document.** |
| 1632 | 38.3.15.5 | 141.35 | Define 37.x.x.x.x (Allowed settings of the Trigger frame  fields and TRS Control subfield) | as in comment | Revised.  Agree with the commenter. The subclause “Allowed settings of the Trigger frame fields and TRS Control subfield” is added  **TGbn editor, please make the changes tagged by CID #1632 in this document.** |
| 3275 | 9.3.1.22.6 | 47.65 | We should disallow the RU Allocation field indicate a RU located in more than one 80MHz subblocks where the corresponding bits in the DRU/RRU Indication subfield set to unequal values. | See Comment | Rejected.  This was already covered by the DRU/RRU Indication subfield of the Common Info field in subclause 9.3.1.22.2. Therefore, we don’t need to further describe any restrictions regarding RU allocation. |

**Discussion:**

The subclause, 37.3a (UHR MU operation) should be almost same as the subclause, 35.5 (MU operation). This should be referenced, and additional rules are described in each subclause of 37.3a (UHR MU operation).

**Text to be adopted begins here.**

***TGbn editor: Please update UHR MAC Capabilities in 11bn D0.2 to add UHR TRS Support field as below***

9.4.2.aa2.2 UHR MAC Capabilities Information field

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B4 | B5 | B6 | (#1632) B7 | B8 Bx |
|  | DPS Support | DPS Assisting Support | Multi-Link Power Management | NPCA Supported | BSR Enhancement Support | Additional  Mapped  TID  Support | UHR TRS Support |  |
| Bits: | 1 | 1 | 1 | 1 | 1 |  | 1 | x |

**Figure 9-aa5 —UHR MAC Capabilities Information field format**

**Table 9-130a—Subfields of the UHR MAC Capabilities Information field**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| **…** | **…** | **…** |
| (#1632) UHR TRS Support | For a non-AP STA, indicates support for transmitting an UHR TB PPDU after receiving a frame with a TRS Control subfield. | For a non-AP STA that has set the +HTC-HE Support subfield to 1:  Set to 1 if the STA supports transmitting an UHR TB PPDU after receiving a frame with a TRS Control subfield.  Set to 0 otherwise.  Reserved for an AP or if the +HTC-HE Sup-port subfield is 0. |
| **…** | **…** | **…** |

***TGbn editor: Please add the following new subclause 37.3a UHR MU operation to the 802.11bn draft***

***TGbn editor: Please do not add the following “[EHT-reference]” and paragraphs highlighted grey to the 802.11bn draft, as it is provided only for reference from EHT***

37.3a UHR MU operation

37.3a.1 UHR DL MU operation

37.3a.1.1 General

When transmitting or receiving a UHR MU PPDU, the rules defined in 35.5.1.1 (General) and 35.5.1.2 (RU allocation in an EHT MU PPDU) that apply to an EHT MU PPDU shall also apply to the UHR MU PPDU. In cases where a rule in 35.5.1.1 (General) or 35.5.1.2 (RU allocation in an EHT MU PPDU) refers to RUs and MRUs in an EHT MU PPDU, the rule also applies to RUs and MRUs in a UHR MU PPDU.

[M196] (#1200) A UHR AP shall not transmit a UHR MU PPDU with an RU or MRU that is narrower than the PPDU bandwidth and that is allocated to more than one STA (DL MU-MIMO within OFDMA) unless the AP has received from each STA an EHT Capabilities element with the Partial Bandwidth DL MU-MIMO subfield in the EHT PHY Capabilities Information field equal to 1.

**[EHT - reference]**

When transmitting or receiving an EHT MU PPDU, the rules defined in 26.5.1.1 (General), 26.5.1.2 (RU addressing in an HE MU PPDU), and 26.5.1.3a (Minimum RU allocation in an HE MU PPDU) that apply to an HE MU PPDU shall also apply to the EHT MU PPDU. In cases where a rule in 26.5.1.1 (General), 26.5.1.2 (RU addressing in an HE MU PPDU) or 26.5.1.3a (Minimum RU allocation in an HE MU PPDU) refers to RUs in an HE MU PPDU, the rule also applies to RUs and MRUs in an EHT MU PPDU.

An EHT AP shall not transmit an EHT MU PPDU with an RU or MRU that is narrower than the PPDU bandwidth and that is allocated to more than one STA (DL MU-MIMO within OFDMA) unless the AP has received from each STA an EHT Capabilities element with the Partial Bandwidth DL MU-MIMO subfield in the EHT PHY Capabilities Information field equal to 1.

37.3a.1.2 RU allocation in a UHR MU PPDU (#1619)

A UHR STA shall follow the rules defined in 35.5.1.2 (RU allocation in an EHT MU PPDU), where

* Rules related to EHT STAs also apply to UHR STAs.
* Rules related to EHT MU PPDUs also apply to UHR MU PPDUs.
* Rules related RUs and MRUs in an EHT MU PPDU, the rule also applies to RUs and MRUs in a UHR MU PPDU

and the additional rules defined below.

In a 40 MHz, 80 MHz, 160 MHz or 320 MHz UHR MU PPDU, an AP shall not allocate to a 20 MHz operating non-AP STA an RU or MRU that is not supported by the STA as indicated in 38.3.3 (RU and MRU restrictions for 20 MHz operation).

A UHR AP shall not allocate an RU or MRU in the secondary 160 MHz of a 320 MHz UHR MU PPDU or UHR TB PPDU to a 20 MHz operating non-AP UHR STA if either the UHR AP or the 20 MHz operating non-AP UHR STA is not operating in the NPCA mode. If the 20 MHz operating non-AP UHR STA has not set up SST operation on a nonprimary 20 MHz channel with the UHR AP, and if the UHR AP or the 20 MHz operating non-AP UHR STA is not operating in the NPCA mode, a UHR AP shall not allocate an RU or MRU to a 20 MHz operating non-AP UHR STA in any of the following:

* the secondary 20 MHz of a 40, 80, 160, or 320 MHz UHR MU or UHR TB PPDU.
* the secondary 40 MHz of an 80, 160, or 320 MHz UHR MU or UHR TB PPDU.
* the secondary 80 MHz of a 160 or 320 MHz UHR MU or UHR TB PPDU.

A UHR AP shall not allocate an RU or MRU in the secondary 160 MHz of a 320 MHz UHR MU PPDU or UHR TB PPDU to an 80 MHz operating non-AP UHR STA if either the UHR AP or the 80 MHz operating non-AP UHR STA is not operating in the NPCA or DSO mode. A UHR AP shall not allocate an RU or MRU in the secondary 80MHz of a 160 MHz or 320 MHz UHR MU or UHR TB PPDU to an 80 MHz operating non-AP UHR STA if both of the following conditions are true:

* the STA has not established SST operation on the secondary 80 MHz channel with the UHR AP
* Either the UHR AP or the 80 MHz operating non-AP UHR STA is not operating in the NPCA or DSO mode.

A UHR AP shall not allocate an RU or MRU in the secondary 160 MHz channel of a 320 MHz UHR MU PPDU or UHR TB PPDU to a 160 MHz operating non-AP UHR STA, if the 160 MHz operating non-AP UHR STA is not operating in the NPCA or DSO mode.

[M196] The UHR AP shall follow the rules defined in 38.3.3.1 (Supported RU or MRU sizes in partial bandwidth DL and UL MU-MIMO) (#1200) for RU allocation of a UHR MU PPDU if it has received from each STA a EHT Capabilities element with the Partial Bandwidth DL MU-MIMO subfield in the EHT PHY Capabilities Information field set to 1.

A UHR AP that transmits a UHR MU PPDU on the NPCA primary channel shall allocate an RU or MRU that use the NPCA primary channel as the reference primary channel if the UHR AP is operating in NPCA mode (see 37.11 Non-primary channel access (NPCA)).

**[EHT - reference]**

An EHT STA shall not transmit a 320 MHz EHT MU PPDU in the 6 GHz band with a 2×996+484-tone, 3×996-tone, 3×996+484-tone or 4×996-tone RU or MRU allocated to the other EHT STA, unless the EHT STA has received an EHT Capabilities element with the Support For 320 MHz In 6 GHz subfield in the EHT PHY Capabilities Information field equal to 1 from the other EHT STA and the other EHT STA is in 320 MHz operating bandwidth.

A non-AP EHT STA with dot11EHTSupportFor242ToneRUInBWWiderThan20Implemented equal to false shall set the Support For 242-tone RU In BW Wider Than 20 MHz subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element to 0.

An AP shall not transmit a 40 MHz, 80 MHz, 160 MHz or 320 MHz EHT MU PPDU with a 242-tone RU allocated to a 20 MHz operating non-AP EHT STA, unless the AP has received from the 20 MHz operating non-AP EHT STA an EHT Capabilities element with the Support For 242-tone RU in BW Wider Than 20 MHz subfield in the EHT Capabilities Information field equal to 1.

In a 40 MHz, 80 MHz, 160 MHz or 320 MHz EHT MU PPDU, an AP shall not allocate to a 20 MHz operating non-AP STA an RU or MRU that is not supported by the STA as indicated in 36.3.2.6 (RU and MRU restrictions for 20 MHz operation). An AP shall follow the rules in 36.3.2.5 (20 MHz operating non-AP EHT STAs participating in wider bandwidth OFDMA), 36.3.2.7 (80 MHz operating non-AP EHT STAs participating in wider bandwidth OFDMA), and 36.3.2.8 (160 MHz operating non-AP EHT STAs participating in wider bandwidth OFDMA) if allocating RU(s) or MRU(s) to a non-AP EHT STA whose operating bandwidth is smaller than the BSS operating channel width.

An EHT AP shall not allocate an RU or MRU in the secondary 160 MHz of a 320 MHz EHT MU PPDU or EHT TB PPDU to a 20 MHz operating non-AP EHT STA. An EHT AP shall not allocate an RU or MRU outside of the primary 20 MHz in a 40 MHz, 80 MHz, 160 MHz, or 320 MHz EHT MU or EHT TB PPDU to a 20 MHz operating non-AP EHT STA if the 20 MHz operating non-AP EHT STA has not set up SST operation on a nonprimary 20 MHz channel with the EHT AP.

An EHT AP shall not allocate an RU or MRU in the secondary 160 MHz channel of a 320 MHz EHT MU PPDU or EHT TB PPDU to an 80 MHz operating non-AP EHT STA. An EHT AP shall not allocate an RU or MRU in the secondary 80 MHz channel of a 160 MHz or 320 MHz EHT MU or EHT TB PPDU to an 80 MHz operating non-AP EHT STA, if the 80 MHz operating non-AP EHT STA has not set up SST operation on the secondary 80 MHz channel with the EHT AP or there is an inactive 20 MHz subchannel within the secondary 80 MHz channel.

An EHT AP shall not allocate an RU or MRU in the secondary 160 MHz channel of a 320 MHz EHT MU PPDU or EHT TB PPDU to a 160 MHz operating non-AP EHT STA.

37.3a.2 UHR UL MU operation

37.3a.2.1 General

UHR UL MU operation allows an AP to solicit simultaneous immediate response frames from one or more non-AP UHR STAs. UHR UL MU operation expands the UL MU functionalities inherited from EHT. The rules defined in 35.5.2.1 (General) that apply to an EHT STA shall also apply to the UHR STA and the additional rules defined below.

A UHR AP shall not set the UL UHR-MCS subfield of a UHR variant User Info field to 15 in a transmitted Trigger frame if the RU assigned by that User Info field is used for UL MU MIMO transmission.

A UHR AP shall not set the UL UHR-MCS subfield of a UHR variant User Info field to 14 in a transmitted Trigger frame.

A non-AP UHR STA shall set the UHR TRS Support subfield in the UHR MAC Capabilities Information field in the UHR Capabilities element to 1 if its dot11UHRTRSOptionImplemented is true; otherwise, the STA shall set it to 0.

A UHR AP shall not trigger a non-AP EHT or UHR STA to send an HE TB PPDU that covers the secondary 160 MHz.

A UHR AP shall not include the Special User Info field in a Trigger frame if the Trigger frame does not include any EHT or UHR variant User Info field.

A non-AP UHR STA shall not send a BSRP Trigger frame unless it is operating in DUO mode and is the TXOP holder, and the BSRP Trigger frame it transmits carries unavailability information (see 37.12.2 Dynamic Unavailability Operation (DUO) mode)

**[EHT - reference]**

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 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 to 0.

An EHT AP shall not transmit a triggering frame in the 6 GHz band that allocates an RU or MRU in 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 operating bandwidth of the STA is 320 MHz.

A non-AP EHT STA with dot11HEDeviceClass equal to ClassA shall meet the Class A requirements specified in 36.3.16 (Transmit requirements for PPDUs sent in response to a triggering frame) 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 (Transmit requirements for PPDUs sent in response to a triggering frame) 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 to indicate its device class based on dot11HEDeviceClass. See 26.5.2.1 (General).

An EHT AP shall not set the UL EHT-MCS subfield of an EHT variant User Info field to 15 in a transmitted Trigger frame if the RU assigned by that User Info field is used for UL MU MIMO transmission.

An EHT AP shall not set the UL EHT-MCS subfield of an EHT variant User Info field to 14 in a transmitted Trigger frame.

A non-AP EHT STA shall set the EHT TRS Support subfield in the EHT MAC Capabilities Information field in the EHT Capabilities element to 1 if its dot11EHTTRSOptionImplemented is true; otherwise, the STA shall set it to 0.

An EHT AP shall not trigger a non-AP EHT STA to send an HE TB PPDU that covers the secondary 160 MHz.

An EHT AP may transmit a Trigger frame with any variant of the User Info field.

An EHT AP shall not set B55 in the Common field to 0 while setting B54 in the Common Info field to 1 in a Trigger frame (see Table 9-46a (Valid combinations of B54 and B55 in the Common Info field, B39 in the User Info field, and solicited TB PPDU format)). If the bandwidth of a solicited EHT TB PPDU is less than 320 MHz, then an EHT AP shall set the PS160 subfield of the corresponding EHT variant User Info field in the Trigger frame to 0.

An EHT AP shall not include the Special User Info field in a Trigger frame if the Trigger frame does not include any EHT variant User Info field.

A non-AP EHT STA shall check B0 for a primary 160 MHz and 320 MHz indication if the non-AP EHT STA is addressed by an EHT variant User Info field in a Trigger frame.

37.3a.2.2 Rules for soliciting UL MU frames

37.3a.2.2.1 General

A UHR STA shall follow the rules defined in 35.5.2.2.1 (General), where

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

and the additional rules defined below.

A UHR AP shall not transmit an HE or EHT PPDU that carries a Trigger frame soliciting a UHR TB PPDU.

A UHR AP shall not transmit a UHR PPDU that carries a Trigger frame soliciting an HE or EHT TB PPDU.

[M196] A UHR AP shall not transmit a Trigger frame soliciting an OFDMA transmission using a UHR TB PPDU that uses UL MU-MIMO(#1200) within an RU or MRU to a non-AP UHR STA from which the AP has not received a EHT Capabilities element with the Partial Bandwidth UL MU-MIMO subfield of the EHT Capabilities Information field equal to 1.

In a 40 MHz, 80 MHz, 160 MHz, or 320 MHz UHR TB PPDU, an AP shall not allocate to a 20 MHz operating non-AP STA an RU or MRU that is not supported by the STA as indicated in 38.3.3 (RU and MRU restrictions for 20 MHz operation).

[M196] The UHR AP shall follow the rules defined in 38.3.3.1 (Supported RU or MRU sizes in partial bandwidth DL and UL MU-MIMO) (#1200) for soliciting an OFDMA transmission using a UHR TB PPDU that uses UL MU-MIMO within an RU or MUR to a non-AP UHR STA from which the AP has received from a EHT Capabilities element with the Partial Bandwidth UL MU-MIMO subfield of the EHT PHY Capabilities Information field set to 1.

**[EHT - reference]**

An EHT STA shall follow the rules defined in 26.5.2.2.1 (General), 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 PPDUs that are not in an EHT SU transmission and EHT TB PPDUs, respectively.

An EHT AP shall not transmit an HE PPDU that carries a Trigger frame soliciting an EHT TB PPDU.

An EHT AP shall not transmit an EHT PPDU that carries a Trigger frame soliciting an HE TB PPDU.

An EHT AP shall not transmit a Trigger frame soliciting an OFDMA transmission using an EHT TB PPDU that uses UL MU-MIMO within an RU or 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.

In a 40 MHz, 80 MHz, 160 MHz, or 320 MHz EHT TB PPDU, an AP shall not allocate to a 20 MHz operating non-AP STA an RU or MRU that is not supported by the STA as indicated in 36.3.2.6 (RU and MRU restrictions for 20 MHz operation). An AP shall follow the rules defined in 36.3.2.5 (20 MHz operating non-AP EHT STAs participating in wider bandwidth OFDMA), 36.3.2.7 (80 MHz operating non-AP EHT STAs participating in wider bandwidth OFDMA), and 36.3.2.8 (160 MHz operating non-AP EHT STAs participating in wider bandwidth OFDMA) when assigning an RU or MRU to a non-AP EHT STA whose operating bandwidth is smaller than the BSS operating channel width.

37.3a.2.2.2 Requirements for allocating resources

A UHR AP shall follow the requirements for allocating resources specified in 35.5.2.2.2 (Requirements for allocating resources) where rules related to EHT STAs also apply to UHR STAs, and rules related to EHT TB PPDUs also apply to UHR TB PPDUs.

**[EHT - reference]**

An EHT AP shall follow the requirements for allocating resources specified in 26.5.2.2.2 (Requirements for allocating resources) 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 35.4.2 (Block ack procedures).

37.3a.2.2.3 Padding for a Trigger frame

A Trigger frame may include the Padding field to extend the frame length to give the recipient STAs enough time to prepare a response for transmission a SIFS after the frame is received. The Padding field, if present, shall be at least two octets in length and shall be set to all 1s. If the Padding field is present in a Trigger frame, its length shall be computed as described below.

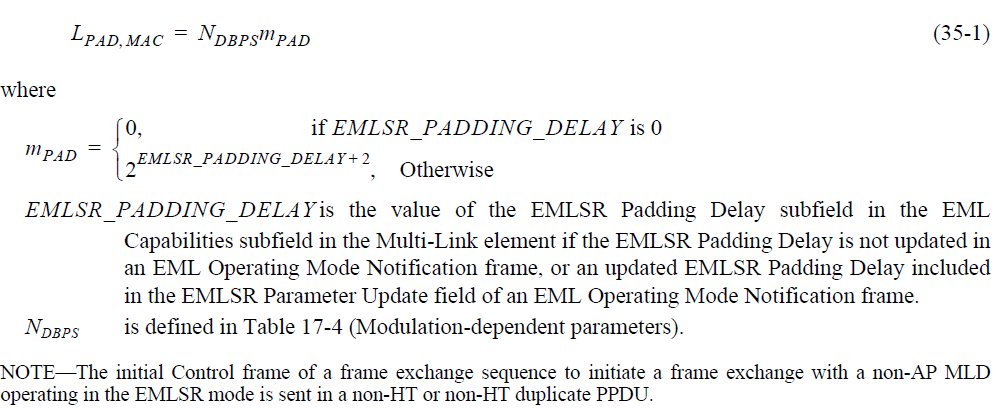
A UHR AP shall ensure that there is sufficient padding in a triggering frame as specified in 35.5.2.2.3 (Padding for a triggering frame).

**[EHT - reference]**

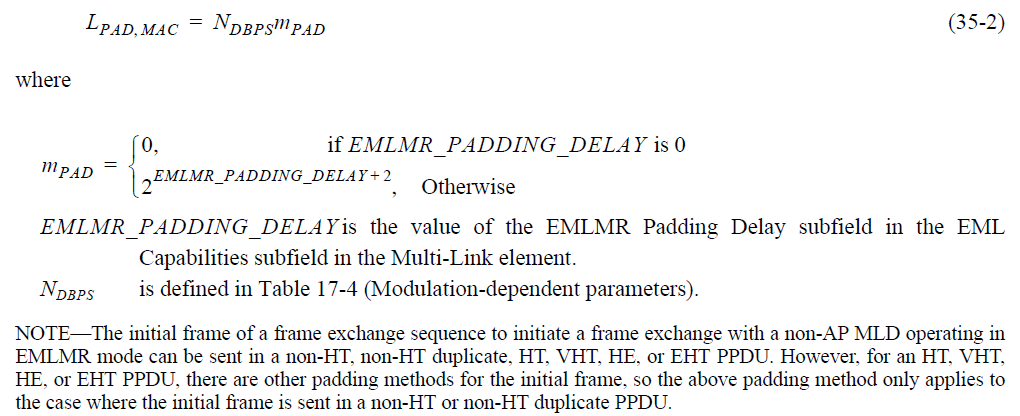
A Trigger frame may include the Padding field to extend the frame length to give the recipient STAs enough time to prepare a response for transmission a SIFS after the frame is received. The Padding field, if present, shall be at least two octets in length and shall be set to all 1s. If the Padding field is present in a Trigger frame, its length shall be computed as described below.

An EHT AP shall ensure that there is sufficient padding in a triggering frame as specified in 26.5.2.2.3 (Padding for a triggering frame) 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 the EMLSR mode, the AP shall ensure that the number of bits in the PSDU following the last bit of the User Info field addressed to the non-AP MLD is at least defined in Equation (35-1) together with the padding requirement defined in 26.5.2.2.3 (Padding for a triggering frame).



When an EHT AP of an AP MLD transmits a triggering frame in a 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 the User Info field addressed to the non-AP MLD is at least defined in Equation (35-1) together with the padding requirement defined in 26.5.2.2.3 (Padding for a triggering frame)



37.3a.2.2.4 Allowed settings of the Trigger frame fields and TRS Control subfield (#1632)

A UHR AP may transmit a Trigger frame that solicits a UHR TB PPDU from a UHR STA subject to the rules defined in 26.5.2.2 (Rules for soliciting UL MU frames), 35.5.2.2 (Rules for soliciting UL MU frames) and the additional rules defined below.

A UHR AP shall not transmit a Trigger frame that solicits an HE TB PPDU, an EHT TB and a UHR TB PPDU together.

A UHR AP shall set the UL Length subfield of a transmitted Trigger frame that solicits a UHR TB PPDU to the value given by Equation (27-11) with, except that TXTIME is defined by Equation (38-xx) in 38.4.3 (TXTIME and PSDU\_LENGTH calculation).

NOTE 1—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)) and EHT TB PPDU (see 35.5.2.2.4 (Allowed settings of the Trigger frame fields and TRS Control subfield)).

An AP shall not send a frame with a TRS Control subfield that solicits a UHR TB PPDU to a non-AP STA from which the AP has not received a UHR MAC Capabilities Information field in the UHR Capabilities element with the UHR TRS Support subfield equal to 1.

A UHR AP may transmit a BSRP Trigger frame that solicits a non-HT (dup) PPDU from a UHR STA subject to the rules defined in 37.12.2 (Dynamic Unavailability Operation (DUO) mode)

A UHR AP shall set the GI and HE/UHR-LTF Type subfield to a value of 0, 1, or 2 if the BSRP Trigger frame is addressed to more than one STA. A UHR AP may set the GI and HE/UHR-LTF Type subfield to any value of 0, 1, 2, or 3 (see Figure 9-90b2) if the BSRP Trigger frame is individually addressed

An AP shall not send a PPDU that is not an HE PPDU, an EHT PPDU or a UHR PPDU, that carries a TRS Control subfield.

**[EHT – reference]**

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.

An EHT AP that includes the Special User Info field in a Trigger frame shall set all bits of the Disregard In U-SIG-1 subfield and the four LSBs of the Disregard In U-SIG-2 subfield to 1. The MSB of the Disregard In U-SIG-2 subfield is implementation specific and should be set to 0 if the Trigger frame is carried in a PPDU that does not contain a frame with a TRS Control subfield. If the Trigger frame is carried in a PPDU that contains a frame with a TRS Control subfield, then the Disregard In U-SIG-2 subfield in the Special User Info field shall be set to 1.

An EHT AP shall not transmit a Trigger frame that solicits both an HE TB PPDU and an EHT TB PPDU. An EHT AP shall not transmit a Trigger frame that contains a User Info field whose AID12 subfield is equal to 0 or 2045 unless both B54 and B55 in the Common Info field of the Trigger frame are equal to 1.

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 Flag subfield to 0 and the Special User Info field shall be placed immediately after the Common Info field. An EHT AP shall set 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 B54 in the Common Info field of the Trigger frame to 0. An EHT AP shall not transmit a Trigger frame with B54 equal to 1 and B55 equal to 0 in the Common Info field of the Trigger frame.

NOTE 1—An EHT AP does not assign an AID value of 2007 to any STA or non-AP MLD (see 35.15 (EHT BSS operation)).

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, except that TXTIME is defined by Equation (36-110).

NOTE 2—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)).

An AP shall not send a frame with a TRS Control subfield that solicits an EHT TB PPDU to a non-AP STA from which the AP has not received an EHT MAC Capabilities Information field in the EHT Capabilities element with the EHT TRS Support subfield equal to 1.

An AP shall not send an EHT MU PPDU with a 4×996-tone RU if the 4×996-tone RU carries a TRS Control subfield.

The AP affiliated with an AP MLD and operating on a link shall not set the Preferred AC subfield in the Trigger Dependent User Info field of the User Info field of a Basic Trigger frame that is directed to a non-AP STA that is affiliated with a non-AP MLD to an ACI for which no corresponding TID is mapped in UL to the link for the non-AP MLD by the TTLM (see 35.3.7 (Link management)).

NOTE 3—If one of the two TIDs matching the indicated Preferred AC is not mapped to the link where the Trigger frame is sent, then data frames belonging to the unmapped TID cannot be transmitted on that link, following 35.3.7 (Link management).

An AP shall not send a PPDU that is neither an HE PPDU nor an EHT PPDU that carries a TRS Control subfield.

37.3a.2.2.5 AP access procedures for UL MU operation

A UHR AP shall follow the AP access procedures for UL MU operation as specified in 35.5.2.2.5 (AP access procedures for UL MU operation) where rules related to EHT STAs also apply to UHR STAs.

**[EHT – reference]**

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

37.3a.2.3 Non-AP STA behavior for UL MU operation

37.3a.2.3.1General

A UHR STA shall follow the rules defined in 35.5.2.3.1 (General), where

* Rules related to EHT STAs also apply to UHR STAs.
* Rules related to EHT variant User Info field also apply to UHR variant User Info field.
* Rules related to EHT MU and EHT TB PPDUs also apply to UHR MU PPDUs and UHR TB PPDUs, respectively.

and the additional rules defined below.

A non-AP UHR STA shall not send a UHR TB PPDU unless it is explicitly triggered by an AP in the operation modes described in 37.3a.2.3.2 (TXVECTOR parameters for UHR TB PPDU response to Trigger frame).

**[EHT – reference]**

A non-AP EHT STA that transmits a TB PPDU shall satisfy the conditions defined in 26.5.2.3.1 (General), 26.5.2.3.2 (Conditions for not responding with an HE TB PPDU), 26.5.2.3.5 (RA field for frames carried in an HE TB PPDU), 26.5.2.4 (A-MPDU contents in an HE TB PPDU), and 35.5.2.3.4 (Conditions for not responding with a TB PPDU) 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 B39 of the User Info field is set to 0 and B54 of 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 in which the AID12 subfield matches its AID, then if the Trigger frame is not an MU RTS Trigger frame, the STA shall respond with an EHT TB PPDU. If a non-AP EHT STA receives an HE variant User Info field in a Trigger frame in which the AID12 subfield matches its AID, then if the Trigger frame is not an MU RTS Trigger frame, the STA shall respond with an HE TB PPDU.

An EHT STA shall not transmit an EHT TB PPDU if B55 of the Common Info field of the soliciting Trigger frame is set to 1.

NOTE—A non-AP EHT STA is an HE STA, so the non-AP EHT STA might contend for an RA-RU and transmit an HE TB PPDU, if the STA receives an HE variant User Info field that allocates RA-RU(s) in a Trigger frame (see 26.5.4 (UL OFDMA-based random access (UORA))).

A non-AP EHT STA shall not send an EHT TB PPDU unless it is explicitly triggered by an AP in the operation modes described in 35.5.2.3.2 (TXVECTOR parameters for EHT TB PPDU response to Trigger frame).

37.3a.2.3.2 TXVECTOR parameters for UHR TB PPDU response to Trigger frame

***TGbn editor: Please leave this as a placeholder subclause. This subclause can be completed after the TXVECTOR parameters for UHR are defined.***

**[EHT – reference]**

A non-AP EHT STA that responds to a Trigger frame that solicits an HE TB PPDU sets the TXVECTOR parameters as defined in 26.5.2.3.3 (TXVECTOR parameters for HE TB PPDU response to Trigger frame).

A non-AP UHR STA that responds to a Trigger frame that solicits an EHT TB PPDU sets the TXVECTOR parameters as defined in 35.5.2.3.2 (TXVECTOR parameters for EHT TB PPDU response to Trigger frame).

A non-AP EHT STA that responds to a Trigger frame that solicits an EHT TB PPDU shall set the TXVECTOR parameters below as follows:

* The FORMAT parameter is set to EHT\_TB.
* The BSS\_COLOR parameter is set as follows:
  + If the Trigger frame was received in an HE or EHT PPDU, then the BSS\_COLOR parameter is set to the value of the RXVECTOR parameter BSS\_COLOR of the PPDU.
  + Otherwise, the BSS\_COLOR parameter is set to the value of the active BSS color as defined in 26.11.4 (BSS\_COLOR).
* The L\_LENGTH parameter is set to the value indicated by the UL Length subfield in the Common Info field.
* The NUM\_STS parameter is set to the number of spatial streams indicated by the Number Of Spatial Streams subfield of the SS Allocation field of the EHT variant User Info field.
* The STARTING\_STS\_NUM parameter is set to the value of the Starting Spatial Stream subfield in the SS Allocation field in the EHT variant User Info field.
* The SPATIAL\_REUSE\_1 and SPATIAL\_REUSE\_2 parameters are set to the values of the respective Spatial Reuse subfields in the Special User Info field.
* The CH\_BANDWIDTH parameter is set to the value of the bandwidth of the EHT TB PPDU, and is obtained from the combined value of the UL BW subfield in the Common Info field and the UL Bandwidth Extension subfield in the Special User Info field (see Table 9-46g (UL Bandwidth Extension subfield encoding)).
* The RU\_ALLOCATION parameter is set to the value indicated by the RU Allocation subfield and the PS160 subfield of the User Info subfield.
* The TB\_DISREGARD\_IN\_USIG1, TB\_VALIDATE\_IN\_USIG2, and TB\_DISREGARD\_IN\_USIG2 parameters are set to the value of the Disregard In U-SIG-1, Validate In U-SIG-2, and Disregard In U-SIG-2 subfields, respectively, in the U-SIG Disregard And Validate subfield in the Special User Info field.

All other TXVECTOR parameters that are present are set as defined in 26.5.2.3.3 (TXVECTOR parameters for HE TB PPDU response to Trigger frame).

NOTE—The DCM parameter is not present in an EHT variant User Info field.

37.3a.2.3.3 TXVECTOR parameters for UHR TB PPDU response to TRS Control subfield

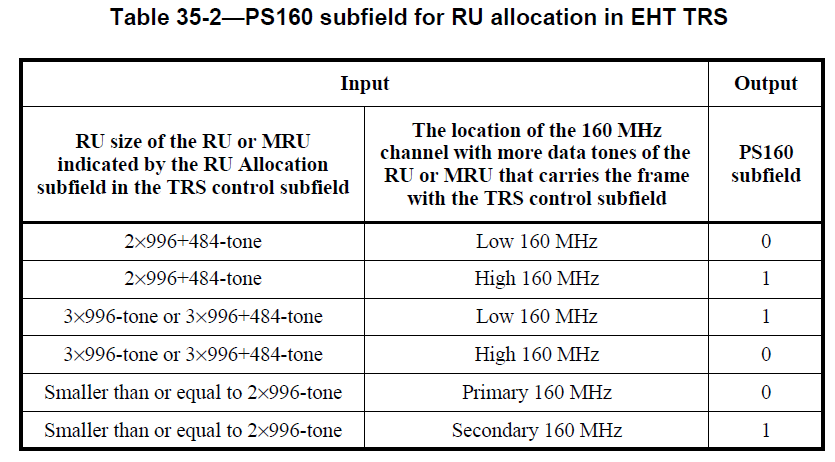
***TGbn editor: Please leave this as a placeholder subclause. This subclause can be completed after the TXVECTOR parameters for UHR are defined.***

**[EHT – reference]**

A non-AP STA transmitting an EHT TB PPDU in response to a soliciting EHT PPDU carrying a frame containing a TRS Control subfield shall set the TXVECTOR parameters as follows:

* The FORMAT parameter is set to EHT\_TB if the RXVECTOR parameter FORMAT of the soliciting PPDU is equal to EHT\_MU.
* The TRIGGER\_METHOD parameter is set to TRS.
* The L\_LENGTH parameter is computed as described in Equation (27-11) with using the TXTIME value. The TXTIME is defined by Equation (36-110) where *NSYM* is set to *FVAL* + 1, where *FVAL* is the value of the UL Data Symbols subfield of the TRS Control subfield.
* The RU\_ALLOCATION parameter is set to the value indicated by the RU Allocation subfield of the TRS Control subfield and a PS160 subfield, which is determined based on the RU allocation in the soliciting PPDU according to Table 35-2 (PS160 subfield for RU allocation in EHT TRS).
* The MCS parameter is set to the value of the UL MCS subfield of the TRS Control subfield.
* The CH\_BANDWIDTH parameter is set to the value of the RXVECTOR parameter CH\_BANDWIDTH of the soliciting PPDU (see Table 36-1 (TXVECTOR and RXVECTOR parameters)).
* The BSS\_COLOR parameter is set to the values of the RXVECTOR parameter BSS\_COLOR of the soliciting PPDU.
* The NUM\_EHT\_LTF parameter is set to 1.
* The STARTING\_STS\_NUM parameter is set to 0.
* The NUM\_STS parameter is set to 1.
* The FEC\_CODING parameter is set to BCC\_CODING if the RU Allocation subfield indicates an RU or MRU that is smaller than a 484-tone RU; otherwise, it is set to LDPC\_CODING.
* The LDPC\_EXTRA\_SYMBOL parameter is set to 0 if the RU Allocation subfield indicates an RU or MRU that is smaller than a 484-tone RU; otherwise, it is set to 1.
* The SPATIAL\_REUSE parameter is set to PSR\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED.
* If the received EHT Default PE Duration subfield of the EHT Operation Parameters field in the EHT Operation element transmitted by the AP with which the non-AP STA is associated is set to 0, the DEFAULT\_PE\_DURATION parameter is set to the default PE duration value indicated by the AP in the Default PE Duration subfield of the HE Operation element it transmits; Otherwise, the DEFAULT\_PE\_DURATION parameter is set to 20 μs.
* The TXOP\_DURATION parameter is set as defined in 26.11.5 (TXOP\_DURATION).
* All U-SIG Disregarded and Validate bits are set to 1.
* If the RXVECTOR parameters EHT\_LTF\_TYPE and GI\_TYPE of the soliciting PPDU are either 4× EHT-LTF and 3u2s\_GI, respectively, or 2× EHT-LTF and 1u6s\_GI, respectively, then the EHT\_LTF\_TYPE and GI\_TYPE parameters are set to 4× EHT-LTF and 3u2s\_GI, respectively. Otherwise, the EHT\_LTF\_TYPE and GI\_TYPE parameters are set to 2× EHT-LTF and 1u6s\_GI, respectively.
* The TXPWR\_LEVEL\_INDEX parameter is set to a value based on the computed transmission power (see 36.3.16.2 (Power pre-correction)) for an EHT TB PPDU, the value of the AP Tx Power subfield of the TRS Control subfield and the UL Target Receive Power subfield of the TRS Control subfield.

NOTE—A non-AP STA transmitting an EHT TB PPDU in response to a frame carrying a TRS Control subfield considers that both the physical CS and the virtual CS are set to 0 (see 35.5.2.4 (UL MU CS mechanism for EHT STAs)).



37.3a.2.3.4 Conditions for not responding with a TB PPDU

A UHR STA shall follow the rules defined in 35.5.3.4 (Conditions for not responding with a TB PPDU), where

* Rules related to EHT STAs also apply to UHR STAs.
* Rules related to triggering frames also apply to triggering frames soliciting UHR TB PPDUs.
* Rules related to EHT TB PPDUs also apply to UHR TB PPDUs.

**[EHT – reference]**

If a non-AP EHT STA is solicited to send a TB PPDU by a Trigger frame and the combination of B54 and B55 in the Common Info field, and B39 in the User Info field addressed to it in the Trigger frame does not match any of the combinations of the values specified in the rows in Table 9-46a (Valid combinations of B54 and B55 in the Common Info field, B39 in the User Info field, and solicited TB PPDU format), then the STA shall not respond to the Trigger frame. If B39 is equal to 1, then the non-AP EHT STA shall not respond with an EHT TB PPDU unless the bandwidth for the solicited EHT TB PPDU is specified as 320 MHz in the Trigger frame.

37.3a.2.4 UL MU CS mechanism for UHR STAs

A UHR STA shall follow the rules defined in 35.5.2.4 (UL MU CS mechanism for EHT STAs), except that the EHT STA shall use the rules defined in 38.3.25.6.4 (Per 20 MHz CCA sensitivity) instead of those defined in 36.3.21.6.4 (Per 20 MHz CCA sensitivity) when CCA is performed on any nonpunctured 20 MHz subchannel in an EHT BSS and the additional rules defined below.

Specifically, if the CS Required subfield in a Trigger frame is 1, then the non-AP STA shall consider the status of the CCA (using energy detect defined in 38.3.25.6.4 (Per 20 MHz CCA sensitivity) and the virtual carrier sense (NAV)) during the SIFS between the PPDU that contains the Trigger frame and the PPDU sent in response to the Trigger frame. In this case, when performing CCA, the non-AP STA shall sense the medium using energy detect after receiving the PPDU that contains the Trigger frame (i.e., during the SIFS), and it shall perform the energy detect at least in the subchannel that contains the non-AP STA’s UL allocation, where the sensed subchannel consists of one or more occupied 20 MHz channels. The non-AP STA may transmit the solicited PPDU if all the occupied 20 MHz channels containing the RUs allocated in the Trigger frame are considered idle. If the non-AP STA detects that any of the occupied 20 MHz channels containing the allocated RUs is not idle, then the non-AP STA shall not transmit.

**[EHT – reference]**

An EHT STA shall follow the rules defined in 26.5.2.5 (UL MU CS mechanism), except that the EHT STA shall use the rules defined in 36.3.21.6.4 (Per 20 MHz CCA sensitivity) instead of those defined in 27.3.22.6.5 (Per 20 MHz CCA sensitivity) when CCA is performed on any nonpunctured 20 MHz subchannel in an EHT BSS.

Specifically, if the CS Required subfield in a Trigger frame is 1, then the non-AP STA shall consider the status of the CCA (using energy detect defined in 36.3.21.6.4 (Per 20 MHz CCA sensitivity) and the virtual carrier sense (NAV)) during the SIFS between the PPDU that contains the Trigger frame and the PPDU sent in response to the Trigger frame. In this case, when performing CCA, the non-AP STA shall sense the medium using energy detect after receiving the PPDU that contains the Trigger frame (i.e., during the SIFS), and it shall perform the energy detect at least in the subchannel that contains the non-AP STA’s UL allocation, where the sensed subchannel consists of one or more occupied 20 MHz channels. The non-AP STA may transmit the solicited PPDU if all the occupied 20 MHz channels containing the RUs allocated in the Trigger frame are considered idle. If the non-AP STA detects that any of the occupied 20 MHz channels containing the allocated RUs is not idle, then the non-AP STA shall not transmit.