IEEE P802.11
Wireless LANs

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| Proposed changes for MU type sounding feedback |
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Abstract

This submission proposes text changes of TGbe Draft 1.0

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: clarify full partial BW with more details.
* Rev 2: address comments during the TC, add clarifications for SU type feedback.

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 0.3. 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.***

**Disussions:**

1. **Main change of this document:** In the current 11be draft, it’s **optional** to support **Partial BW DL MUMIMO,** however the support of **Partial BW MU\_Type feedback,** which is used to support Partial BW DL MUMIMO, is **mandatory**. This document proposes to change the mandatory support of Partial BW MU\_Type feedback from mandatory to conditional mandatory. Namely, **if a non-AP STA supports the reception of Partial BW DL MUMIMO, the STA shall support transmit Partial BW MU Type feedback, otherwise it’s optional**.
2. **Clarifications:** Scenarios that should be categorized as full BW feedback but now is treated as partial BW feedback:
	1. Full BW with puncture: E.g. 160MHz NDPA with 40MHz punctured. If NDPA indicate 996+484-tone feedback for 160/320 operating BFee, this should be full BW feedback.
	2. Smaller BW operating STA in larger BW NDPA: 160MHz NDPA with 40MHz punctured. If NDPA indicate 996-tone feedback for 80MHz operating BFee (punctured 40Mhz is out of BFee’s operating BW), this should be full BW feedback.

New definitions of Full and partial BW feedback:

Full bandwidth SU, MU or CQI feedback refers to the feedback mode where the Feedback RU/MRU size indicated in the Partial BW Info subfield of the EHT NDP Announcement frame spans all the available BW within an EHT beamformee’s operating BW. Partial bandwidth SU, MU or CQI feedback refers to the feedback mode where the Feedback RU/MRU size indicated in the Partial BW Info subfield of the EHT NDP Announcement frame spans part of the available BW within an EHT beamformee’s operating BW.

* + - * If the EHT beamformee’s operating BW is larger than or equal to the BW of NDP frame, the available BW is the entire PPDU BW of the NDP frame when puncture is not applied and is the entire occupied PPDU BW of NDP frame when puncture is applied.
* If the EHT beamformee’s operating BW is smaller than the BW of NDP frame, the available BW is the beamformee’s entire operating BW when preamble puncturing is not applied and is the entire occupied BW within the beamformee’s operating BW when preamble puncture is applied.
1. **Based on the new definition of full BW and partial BW, the supported feedback RU/MRU sizes for MU feedback are listed in table below**

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| Table 1 The supported feedback RU/MRU size for MU feedback |
| **Operating channel width of the EHT beamformee (MHz)** |  | **Bandwidth of EHT NDP Announcement frame (MHz)** |
| 20 | 40 | 80 | 160 | 320 |
| 20  | Mandatory supported RU/MRU  | 242 | N/A |
| Optional supported RU/MRU | N/A | 242 | 242 | 242 | N/A |
| 40 | Mandatory supported RU/MRU | 242 | 484 | N/A |
| Optional supported RU/MRU | N/A | 242 | N/A |
| 80 | Mandatory supported RU/MRU | 242 | 484 | 484+242 (p), 996 | 484+242 (p), 996 | 996 |
| Optional supported RU/MRU | N/A | 242 | 242, 484, 484+242(np) | 242, 484, 484+242 (np) | 484 |
| 160 | Mandatory supported RU/MRU | 242 | 484 | 484+242(p), 996 | 996+484(p), 996+484+242(p), 2x996 | 996+484(p), 2x996 |
| Optional supported RU/MRU | N/A | 242 | 242, 484, 484+242(np) | 242, 484, 996, 484+242(np), 996+484(np) | 484, 996, 996+484(np) |
| 320 | Mandatory supported RU/MRU | 242 | 484 | 484+242, 996 | 996+484(p), 996+484+242(p), 2x996 | 2x996+484(p), 3x996(p), 3x996+484(p), 4x996 |
| Optional supported RU/MRU | N/A | 242 | 242, 484, 484+242(np) | 242, 484, 996, 484+242(np),996+484(np) | 484, 996, 996+484, 2x996, 2x996+484(np), 3x996+484(np), 3x996(np) |
| Note: “p” in the bracket right after the MRU means puncture is applied in the NDP BW within beamformee’s operating BW; “np” in the bracket right after the MRU means puncture is not applied in the NDP BW within beamformee’s operating BW. |

**Proposed text changes in D1.0:**

**In the section of “9.4.2.295c.3 EHT PHY Capabilities Information field” change the two capability fiels below**

|  |  |  |
| --- | --- | --- |
| Triggered MU Beamforming Partial BWFeedback | For an AP, indicates support for the reception of partial bandwidth MU feedback in an EHT TB sounding sequence. For a non-AP STA, indicates support for the transmission of partial bandwidth MU feedback in an EHT TB sounding sequence. | Set to 0 if not supported.Set to 1 if supported. For a non-AP STA, this field is set to 1 if the Partial Bandwidth DL MU-MIMO subfield is set to 1. |

**In P.L. 289.27 make the following changes.**

The bandwidth (partial or full) of the feedback solicited by an EHT beamformer from an EHT beamformee
depends on the Partial BW Info subfield in the STA Info field identifying the EHT beamformee in the EHT
NDP Announcement frame and the bandwidth of the EHT NDP Announcement frame. The bandwidth of
the EHT NDP Announcement frame and the EHT NDP frame shall be same.

Full bandwidth SU, MU or CQI feedback refers to the feedback mode where the Feedback RU/MRU size indicated in the Partial BW Info subfield of the EHT NDP Announcement frame spans all the available BW within an EHT beamformee’s operating BW. Partial bandwidth SU, MU or CQI feedback refers to the feedback mode where the Feedback RU/MRU size indicated in the Partial BW Info subfield of the EHT NDP Announcement frame spans part of the available BW within an EHT beamformee’s operating BW.

* + - * If the EHT beamformee’s operating BW is larger than or equal to the BW of NDP frame, the available BW is the entire PPDU BW of the NDP frame when puncture is not applied and is the entire occupied PPDU BW of NDP frame when puncture is applied.
* If the EHT beamformee’s operating BW is smaller than the BW of NDP frame, the available BW is the beamformee’s entire operating BW when preamble puncturing is not applied and is the entire occupied BW within the beamformee’s operating BW when preamble puncture is applied.
* Note: For example, if a 160 MHz EHT NDP has a 20 MHz puncturing
* The available BW is 140 MHz when the beamformee’s operating BW is 160MHz or 320MHz.
* The available BW is 80MHz when the beamformee’s operating BW is 80MHz and the 20 MHz puncturing is not within the beamformee’s operating BW.
* The available BW is 60MHz when beamformee’s operating BW is 80MHz and the 20 MHz puncturing is within the beamformee’s operating BW.

An EHT NDP Announcement frame shall only request partial BW feedback on a large RU or MRU that is defined for each signal bandwidth in 36.3.2 (Subcarrier and resource allocation).

An EHT NDP Announcement frame shall not request feedback on a 242-tone RU that is signaled as punctured in the U-SIG of the NDP that follows the EHT NDP Announcement frame.

An EHT NDP Announcement frame shall not request partial BW feedback on a 242-tone RU outside of the beamformee’s operating channel width.

An SU beamformer may solicit full bandwidth SU feedback from an SU beamformee in an EHT non-TB sounding sequence. An SU beamformer shall not solicit partial bandwidth SU feedback from an SU beamformee in an EHT non-TB sounding sequence. In an EHT non-TB sounding sequence case, the occupied BW indicated by the BW field and Puncturing Channel Information fields in the U-SIG of NDP shall be the same as the Feedback RU/MRU size indicated in the Partial BW Info subfield in the EHT NDP Announcement frame.

An SU beamformer may solicit partial bandwidth or full bandwidth SU feedback from an SU beamformee in an EHT TB sounding sequence if the SU beamformee indicates support by setting the Triggered SU Beamforming Feedback subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits to 1.

An MU beamformer may solicit full bandwidth MU feedback from an MU beamformee in an EHT TB sounding sequence. An MU beamformer may solicit partial bandwidth MU feedback from an MU beamformee in an EHT TB sounding sequence if the MU beamformee indicates support by setting the Triggered MU Beamforming Partial BW Feedback subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits to 1. An MU beamformer shall not solicit MU feedback in an EHT non-TB sounding sequence.

An MU beamformer may solicit partial bandwidth or full bandwidth CQI feedback from an MU beamformee in an EHT TB sounding sequence if the MU beamformee indicates support by setting the Triggered CQI Beamforming Feedback subfield to 1.

An MU beamformer may solicit partial bandwidth or full bandwidth CQI feedback from an MU beamformee in an EHT non-TB sounding sequence if the MU beamformee indicates support by setting the Non-Triggered CQI Beamforming Feedback subfield to 1.

**Replace P.L. 291.40 to P.L.292.2 with the table 35-a1 and text below.**

In an EHT non-TB sounding sequence, a 20 MHz operating EHT beamformee shall support SU feedback for 242-tone RU solicited with an EHT NDP announcement frame of bandwidth of 20MHz.

In an EHT TB sounding sequence, a 20 MHz operating EHT beamformee may support SU feedback for 242-tone RU solicited with an EHT NDP announcement frame of bandwidth of 20MHz, 40MHz, 80MHz and 160MHz.

A 20 MHz operating EHT beamformee shall support MU feedback for 242-tone RU solicited with an EHT NDP announcement frame of bandwidth of 20MHz.

A 20 MHz operating EHT beamformee may support MU feedback for 242-tone RU solicited with an EHT NDP announcement frame of bandwidth of 40MHz, 80MHz and 160MHz.

In an EHT non-TB sounding sequence, a 40 MHz operating EHT beamformee shall support SU feedback for 484-tone RU solicited with an EHT NDP announcement frame of bandwidth of 40MHz.

In an EHT TB sounding sequence, a 40 MHz operating EHT beamformee may support SU feedback for 242-tone and 484-tone RU solicited with an EHT NDP announcement frame of bandwidth of 20MHz and 40MHz.

A 40 MHz operating EHT beamformee shall support MU feedback for the combinations of RU size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 20MHz
* 484-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz.

A 40 MHz operating EHT beamformee may support MU feedback for 242-tone RU solicited with an EHT NDP announcement frame of bandwith of 40MHz.

In an EHT non-TB sounding sequence, an 80 MHz operating EHT beamformee shall support SU feedback for 996-tone RU and 484+242-tone MRU (if the MRU is full BW feedback) solicited with an EHT NDP announcement frame of bandwidth of 80MHz.

In an EHT TB sounding sequence, an 80 MHz operating EHT beamformee may support SU feedback for the Feedback RU/MRU Size as shown in Table 9-28e (Settings for BW, Partial BW Info subfield in the EHT NDP Announcement frame) which are within its operating channel width and solicited with an EHT NDP announcement frame of bandwidth of 20MHz, 40 MHz, 80 MHz, 160 MHz, and 320 MHz.

An 80 MHz operating EHT beamformee shall support MU feedback for the combinations of RU/MRU (if the MRU is full BW feedback) size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 20MHz;
* 484-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz;
* 484+242-tone MRU and 996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 80MHz or 160MHz;
* 996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 320MHz.

An 80 MHz operating EHT beamformee may support MU feedback for the combinations of RU/MRU (if the MRU is partial BW feedback) size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz;
* 242-tone, 484-tone RU and 484+242-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 80MHz or 160MHz;
* 484-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 320MHz.

In an EHT non-TB sounding sequence, a 160 MHz operating EHT beamformee shall support SU feedback for 2x996-tone RU and 996+484-tone, 996+484+242-tone MRU (if the MRUs are full BW feedback) solicited with an EHT NDP Annoucement frame of bandwidth of 160MHz.

In an EHT TB sounding sequence, a 160 MHz operating EHT beamformee may support SU feedback for the Feedback RU/MRU Size as shown in Table 9-28e (Settings for BW, Partial BW Info subfield in the EHT NDP Announcement frame) which are within its operating channel width and solicited with an EHT NDP Announcement frame of bandwidth of 20MHz, 40 MHz, 80 MHz, 160 MHz, and 320 MHz.

A 160 MHz operating EHT beamformee shall support MU feedback for the combinations of RU/MRU (if the MRUs are full BW feedback) size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 20MHz;
* 484-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz;
* 484+242-tone MRU and 996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 80MHz;
* 996+484-tone, 996+484+242-tone MRU and 2x996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 160MHz;
* 996+484-tone MRU and 2x996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 320MHz.

A 160 MHz operating EHT beamformee may support MU feedback for the combinations of RU/MRU (if the MRUs are partial BW feedback) size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz;
* 242-tone, 484-tone RU and 484+242-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 80MHz;
* 242-tone, 484-tone, 996-tone RU and 484+242-tone, 996+484-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 160MHz;
* 484-tone, 996-tone RU and 996 + 484-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 320MHz.

In an EHT non-TB sounding sequence, a 320 MHz operating EHT beamformee shall support SU feedback for 4x996-tone RU and 3x996-tone,3x996+484-tone, 2x996+484-tone MRU (if the MRUs are full BW feedback) solicited with an EHT NDP announcement frame of bandwidth of 320MHz.

In an EHT TB sounding sequence, a 320 MHz operating EHT beamformee may support SU feedback for the Feedback RU/MRU Size as shown in Table 9-28e (Settings for BW, Partial BW Info subfield in the EHT NDP Announcement frame) which are within its operating channel width and solicited with an EHT NDP Announcement frame of bandwidth of 20MHz, 40 MHz, 80 MHz, 160 MHz, and 320 MHz.

A 320 MHz operating EHT beamformee shall support MU feedback for the combinations of RU/MRU (if the MRUs are full BW feedback) size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 20MHz;
* 484-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz;
* 484+242-tone MRU and 996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 80MHz;
* 996+484-tone MRU, 996+484+242-tone MRU and 2x996-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 160MHz;
* 4x996-tone RU and 2x996+484-tone, 3x996-tone, 3x996+484-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 320MHz.

A 320 MHz operating EHT beamformee may support MU feedback for the combinations of RU/MRU (if the MRUs are partial BW feedback) size and NDP announcement BW below

* 242-tone RU feedback solicited with an EHT NDP announcement frame of bandwith of 40MHz;
* 242-tone, 484-tone RU and 484+242-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 80MHz;
* 242-tone, 484-tone, 996-tone RU and 484+242-tone, 996+484-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 160MHz;
* 484-tone, 996-tone, 2x996-tone RU and 996+484-tone, 2x996+484-tone, 3x996+484-tone, 3x996-tone MRU feedback solicited with an EHT NDP announcement frame of bandwith of 320MHz.