IEEE P802.11  
Wireless LANs

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| D0.3 CR for Spatial Stream And MIMO Enhancement | | | | |
| Date: 2021-2-18 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | Email |
| Wook Bong Lee | Samsung |  |  | wookbong.lee@samusng.com |
|  |  |  |  |  |

Abstract

This submission proposes resolutions for the following comments on spatial stream and MIMO enhancement of TGbe D0.3:

* 1094, 1103, 1115, 1120, 1487, 1493, 1639, 1641, 1939, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2941, 3124, 3125, 3242

Baseline documents: TGbe D0.3, TGax D8.0, 11-21/0011r9, and 11-21/0137r4.

Revisions:

* Rev 0: Initial version of the document. Use D0.3 as baseline spec text. All text without (#CID) are accepted PDT in 11-21/0011r9 and 11-21/0137r4.
* Rev 1: limit Nc to 0-7 in NDP-A.

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.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause Number** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 1115 | 9.3.1.19 | 54 | NDPA announcement frame will change based on ongoing PDT, so there may be some unforeseen inconsistencies that need to be fixed after that inclusion. Please make sure there is no inconsistency (reminder comment). | As in comment. | **Revised.**  Included all accepted changes in PDT (11-21/0137r4) in 11-21/0272r0 as well so that there is no inconsistency.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 1493 | 9.3.1.19 | 54 | Since the HE and Ranging combinations are exhausted, in order to extend usage of the EHT NDP-A frame in next releases, there needs to be a way to prevent EHT STAs from inadvertently decoding an User Info field in a future EHT NDP-A that is not meant for them. | Specify a special AID value (e.g., 2048) such that an EHT STA ignores an NDP-A that contains an User Info field with that AID value. Alternately, require that EHT APs never send NDP-A with some of the reserved AIDs. | **Rejected.**  EHT and EHT+ can be multiplexed together in a single NDP announcement frame. Thus, EHT STA also needs to decode the NDP announcement frame even if there is special AID for future release.  See discussion below for further discussion. |
| 3124 | 9.3.1.19 | 55 | Spec text can be simplified | AID of 2047 is not needed any more in EHT as partial bandwidth field can indicate disallowed subchannels already. Suggested change: delete " if the AID11 subfield is not set to 2047 (TBD) " | **Revised.**  Instead of deleting, it is better not to use AID11 = 2047.  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.    *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 1487 | 9.3.1.19 | 55 | Are there plans to assign AIDs 2008-2044 to associated STAs in EHT ? If not, change the line "if the AID11 subfield is not set to 2047" to "if the AID11 subfield is less than 2008". This would allow possibility to reuse those values between 2008-2044 for other purposes | as in comment. | **Revised.**  For better clarification, AID table is added.  In addition, “The EHT NDP Announcement frame does not contain a STA Info field with the AID 11 subfield larger than 2007.” is now added    *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 3125 | 9.3.1.19 | 56 | Spec text needs to be updated to reflect the latest motion | Suggested change: replace "7-9 bits" with "9 bits" | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 3242 | 9.3.1.19 | 56 | No normative behavior to be described in Clause 9. Delete this paragraph or move it to an appropriate sub-clause. | As shown in the comment. | **Accepted.**  The paragraph is deleted. Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 2227 | 9.3.1.19 | 56 | The use of the term "space-time streams" is no longer correct | change "space-time streams" to "spatial streams" | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 1939 | 9.3.1.19 | 57 | Remove the description for special user info when AID = 2047 if it is not needed for R1 | As in comment | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 1120 | 9.4.1.67a | 62 | EHT MIMO will change based on ongoing PDT, so there may be some unforeseen inconsistencies that need to be fixed after that inclusion. Please make sure there is no inconsistency (reminder comment). Same for the other EHT beamforming/cqi report fields. | As in comment. | **Revised.**  Included all accepted changes in PDT (11-21/0137r4) in 11-21/0272r0 as well so that there is no inconsistency.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 2222 | 9.4.1.67a | 62 | The number of bits of the Sounding Dialog Token Number subfield in Figure 9-144b is not correct. | change the number of bits from 3 to 6 | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 2223 | 9.4.1.67a | 62 | The use of the term "space-time streams" is no longer correct | change "space-time streams" to "spatial streams" | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 2221 | 9.4.1.67a | 63 | Missing a variant of the bandwidth | Set 4 to 320\_1 MHz , Set 5 to 320\_2 MHz | **Rejected.**  Bandwidth in EHT MIMO Control is only used to interprete Partial BW Info. Thus, don’t need to distinguish between 320\_1 and 320\_2.  See discussion below for further discussion. |
| 1639 | 9.4.1.67b | 64 | Nc and Nr size is already extended to 4 bits, supporting 16 spatial streams. Moreover, Nss in subclause 9.4.1.67b is 2-16. However reference Table 9-73 contains Na and angles order only for NcxNr matrices up to 8x8. | Add new additional table should be defined for Nc, Nr > 8. Alternatively add a note, that Table 9-73 has to be updated to support Nc,Nr up to 16. | **Revised.**  16 antennas will be supported in 11be release 2. The size of Nc and Nr in 11be release 1 is just for reserving space for future extension.  Rather than defining “Order of angels in the compressed beamforming feedback matrix” for 16 antennas, we can limit Nr and Nc index up to 7.  In addition, we can modify Nc subfield in NDP-A to Nc Index subfield which cause some confusion. Note that in VHT NDP announcement frame, it is Nc index.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 2224 | 9.4.1.67b | 64 | The use of the term "space-time streams" is no longer correct | change "space-time streams" to "spatial streams" | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 2228 | 9.4.1.67b | 64 | The range of values indicated for Nss,NDP parameter is not correct for R1 | change "where Nss,NDP takes a value between 2 and 16" to "where Nss,NDP takes a value between 2 and 8" | **Accepted.** |
| 2229 | 9.4.1.67b | 64 | The quantization bits b\_\phi for the angle \phi is missing | change the text to "with b\_\phi and b\_\psi defined by the Codebook Information field of the EHT MIMO Control field ... " | **Accepted.** |
| 2225 | 9.4.1.67c | 67 | The use of the term "space-time streams" is no longer correct | change "space-time streams" to "spatial streams" | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 2941 | 9.4.1.67d | 68 | EHT CQI report information shall not include feedback for RU19 which is not defined. Will the EHT CQI report field skip ruidx 19 or define a dummy value for ruidx 19? Please clarify. | Clarify the EHT CQI report field. | **Revised.**  A beamformee shall omit RUs which are not defined.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 1641 | 9.4.1.67d | 68 | Ncqi should be based on Partial BW Info which is in resolution of 242-tone RU, while in text 26-tone RU is mentioned | Provide an explanantion how to obtain Ncqi from Partial BW Info. For example, Ncqi = 9 per bit in Feedback Bitmap if B0 is set to 0 and Ncqi =18 if B0 is set to 1 | **Revised.**  Agree with the commenter.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 2226 | 9.4.1.67d | 68 | The use of the term "space-time streams" is no longer correct | change "space-time streams" to "spatial streams" | **Accepted.**  Already included proposed change in the accepted PDT, 11-21/0137r4. It is also included in 11-21/0272r0.  *TGbe Editor: No further action is needed except to make changes as shown in 11-21/0272r0* |
| 1094 | 26.10.2.2 | 123 | The inclusion of EHT in the HE subclause is a bit misleading. I think the most important thing here is for this frame to be an NDPA. So I would suggest just saying an NDP Announcement. Same comment in the other subclause below. | As in comment. | **Revised.**  Agree with the commenter.  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |
| 1103 | 10.23.2.8 | 85 | Can the BFRP Trigger frame solicit the beamforming report in an HE TB PPDU? Based on the signaling that is defined for the EHT variant Trigger frames it would be possible. Please clarify. | As in comment. | **Revised.**  Allow HE TB PPDU as a response to BFRP (part of EHT sounding procedure).  *TGbe Editor: TGbe editor to make changes as shown in 11-21/0272r0* |

**Discussion:**

Discussion for CID 1493:

The comment says – “Since the HE and Ranging combinations are exhausted, in order to extend usage of the EHT NDP-A frame in next releases, there needs to be a way to prevent EHT STAs from inadvertently decoding an User Info field in a future EHT NDP-A that is not meant for them.”

First of all, EHT and EHT+ can be multiplexed together in a single NDP announcement frame. Thus, EHT STA also needs to decode the NDP announcement frame even if there is special AID for future release.

Second, during the NDP-A proposal discussion, adding version ID was proposed and discussed. One of an idea was using special AID to carry version information. And the other idea was adding version ID in STA Info.

<https://mentor.ieee.org/802.11/dcn/20/11-20-0950-05-00be-partial-bandwidth-feedback-for-multi-ru.pptx>

While both approaches will work, members commented that we don’t need to define it during release 1.

1) In the case of adding version ID in each STA Info, each STA Info is self-decodable. Don’t need to define it now as long as there are reserved bits in STA Info, this approach can be used in future without defining it now.

2) In the case of adding version ID in common info (using special AID) there could be two approaches. One is an interpretation of STA Info after the common info is based on the common info. Another approach is an interpretation of STA Info is based on the version ID as well as the STA version, e.g. STA Info is based on 11be release 2 if the STA is release 2 device and the version ID says it is release 2.

For both approaches, release 1 device does not need to know now.

Discussion for CID 2221:

Bandwidth in EHT MIMO Control is only used to interprete Partial BW Info. Thus, don’t need to distinguish between 320\_1 and 320\_2.

In U-SIG, 320\_1 and 320\_2 are signaled to let OBSS STA know it can stop processing the PPDU which utilizes different 320 MHz channel than BSS.

Proposed Changes:

## *Instruction to 11be Editor: Modify texts in the subclause 9.3.1.19 as follows.*

*Underline text is for addition, and strikeout text is for deletion.*

***Change the title of the subclause 9.3.1.19 as follows:***

### 9.3.1.19 VHT/HE/EHT NDP Announcement frame format

***Change the first paragraph as follows:***

The VHT/HE/EHT NDP Announcement frame has ~~two~~three variants, the VHT NDP Announcement frame, ~~and~~ the HE NDP Announcement frame, and the EHT NDP Announcement frame. The variants~~two formats~~ are distinguished by the setting of the HE subfield and the Ranging subfield in the Sounding Dialog Token field.

***Change the fourth and fifth paragraphs as follows:***

The VHT/HE/EHT NDP Announcement frame contains at least one STA Info field. If the VHT/HE/EHT NDP Announcement frame contains only one STA Info field, then the RA field is set to the address of the STA that can provide feedback (see 10.37.5.2 (Rules for VHT sounding protocol sequences)). If the VHT/HE/EHT NDP Announcement frame contains more than one STA Info field, then the RA field is set to the broadcast address.

The TA field is set to the address of the STA transmitting the VHT/HE/EHT NDP Announcement frame or the bandwidth signaling TA of the STA transmitting the VHT/HE/EHT NDP Announcement frame. In a VHT/HE/EHT NDP Announcement frame transmitted by a VHT, ~~or~~ HE or EHT STA in a non-HT or non-HT duplicate format and where the scrambling sequence carries the TXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT, the TA field is set to a bandwidth signaling TA. In an EHT NDP Announcement frame transmitted by an EHT STA in a non-HT duplicate format with bandwidth greater than 160 MHz, the TBD field in the SERVICE field carries the TXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT as in Table 36-1 (TXVECTOR and RXVECTOR parameters) and the TA field value is a bandwidth signaling TA.

***Change the seventh paragraph as follows:***

The HE subfield and Ranging subfield in the Sounding Dialog Token field are set to 0 to identify the frame as a VHT NDP Announcement frame; the HE subfield and Ranging subfield are set to 1 and 0 respectively to identify the frame as an HE NDP Announcement frame; the HE subfield and Ranging subfield are set to 1 to identify the frame as a an EHT NDP Announcement frame.

***Insert the following paragraphs at the end of the subclause:***

The frame format of the EHT NDP Announcement frame is the same as the HE NDP Announcement frame shown in Figure 9-61a (HE NDP Announcement frame format).

The Duration, RA, and TA fields are set as in a VHT NDP Announcement frame.

The HE subfield and Ranging subfield are set to 1 to identify the frame as an EHT NDP Announcement frame.

The Sounding Dialog Token Number field in the Sounding Dialog Token field contains a value selected by the beamformer to identify the EHT NDP Announcement frame.

The format of a STA Info field in an EHT NDP Announcement frame is defined in [Figure 9-61e (STA Info field format in an EHT NDP Announcement frame)](#bookmark4). The EHT NDP Announcement frame does not contain a STA Info field with the AID 11 subfield larger than 2007. *(#1487)*

B0 B10 B11 B19 B20 B21 B24 B25 B26 B27 B28 B29 B31

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| AID11 | Partial BW Info | Reserved | Nc Index *(#1639)* | Feedback Type And Ng | Disambigu ation | Codebook Size | Reserved |

Bits: 11 9 1 4 2 1 1 3

**Figure 9-61e—STA Info field format in an EHT NDP Announcement frame**

An EHT NDP Announcement frame contains at most one STA Info field per STA.

AID11 subfield encoding in NDP Annoucement frame is defined in Table 9-xyz (AID11 subfield encoding in NDP Announcement frame). *(#1487)*

|  |  |  |
| --- | --- | --- |
| **Table 9-xyz-AID11 subfield encoding in NDP Announcement frame** | | |
| **AID11 subfield** | **Description** | **NDP Announcement frame variant applicability** |
| 0 | STA Info field is addressed to the associated AP | Applicable to any variant |
| 1–2007 | STA Info field is addressed to an associated STA whose AID is equal to the value in the AID11 subfield if the NDP Announcement frame is not a Ranging variant    STA Info field is addressed to an unassociated STA or an associated STA whose RSID/AID is equal to the value in the RSID11/AID11 subfield if the NDP Announcement frame is a Ranging variant | Applicable to any variant |
| 2008–2042 | Reserved | Not applicable to any variant |
| 2043 | STA Info field contains a sequence authentication code if the NDP Announcement frame is a Ranging variant.  This AID11 value is reserved otherwise. | Applicable only to Ranging variant |
| 2044 | STA Info field contains a partial TSF if the NDP Announcement frame is a Ranging variant.  This AID11 value is reserved otherwise. | Applicable only to Ranging variant |
| 2045 | STA Info field contains ranging measurement parameters if the NDP Announcement frame is a Ranging variant.  This AID11 value is reserved otherwise. | Applicable only to Ranging variant |
| 2046 | Reserved | Not applicable to any variant |
| 2047 | STA Info field contains a disallowed subchannel bitmap if the NDP Announcement frame is an HE variant;  This AID11 value is reserved otherwise. | Applicable only to HE variant |

The AID11 subfield contains an identifier of a STA expected to process the following EHT sounding NDP and prepare the sounding feedback.

The Partial BW Info subfield is defined in [Figure 9-61f (Partial BW Info subfield format)](#bookmark5).

|  |  |
| --- | --- |
| B0 | B1 B8 |
| Resolution | Feedback Bitmap |
| 1 | 8 |

**Figure 9-61f—Partial BW Info subfield format**

The Resolution subfield in the Partial BW Info subfield indicates the resolution bandwidth for each bit in Feedback Bitmap. The Feedback Bitmap indicates the request of each resolution bandwidth from lowest frequency to highest frequency with B1 indicating the lowest resolution bandwidth. Each bit in the Feedback Bitmap is set to 1 if the feedback is requested on the corresponding resolution bandwidth.

When the bandwidth of EHT NDP Announcement frame is less than 320 MHz, set the Resolution bit B0 to value 0, indicating resolution of 20 MHz.

* When the bandwidth of EHT NDP Announcement frame is 20 MHz, B1 is set to value 1 to indicate the request of feedback on the 242-tone RU. B2-B8 are Reserved and set to 0.
* When the bandwidth of EHT NDP Announcement frame is 40 MHz, B1 and B2 indicates the request of feedback on each of the two 242-tone RUs from lower frequency to higher frequency. B3-B8 are Reserved and set to 0.
* When the bandwidth of EHT NDP Announcement frame is 80 MHz, B1 to B4 indicates the request of feedback on each of the four 242-tone RUs from lower frequency to higher frequency. B5-B8 are Reserved and set to 0. If B1 to B4 are all set to 1, it indicates the feedback request on 996-tone RU.
* When the bandwidth of EHT NDP Announcement frame is 160 MHz, B1 to B8 indicates the request of feedback on each of the eight 242-tone RUs from lower frequency to higher frequency. If B1 to B4 are all set to 1, it indicates the feedback request on the lower 996-tone RU, and if B5 to B8 are all set to 1, it indicates the feedback request on the higher 996-tone RU.

When the bandwidth of EHT NDP Announcement frame is 320 MHz, set the Resolution bit B0 to value 1, indicating resolution of 40 MHz. B1 to B8 indicates the request of feedback on the each of the eight 484-tone RUs from lower frequency to higher frequency. If B1 and B2 are both set to 1, it indicates the feedback request on the lowest 996-tone RU, and if B3 and B4 are both set to 1, it indicates the feedback request on the second lowest 996-tone RU, and if B5 and B6 are both set to 1, it indicates the feedback request on the second highest 996-tone RU, and if B7 and B8 are both set to 1, it indicates the feedback request on the highest 996-tone RU.

The Partial BW Info subfield is defined in Table 9-X (Settings for BW, Partial BW Info subfield in EHT NDP Announcement frame).

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 9-X- Settings for BW, Partial BW Info subfield in EHT NDP Announcement frame** | | | |
| **Operating channel width of the EHT beamformee (MHz)** | **Bandwidth of EHT NDP Announcement frame** | **Feedback RU/MRU Size** | **Partial BW Info subfield values** |
| 20, 40, 80, 160, 320 | 20 MHz | 242 | 010000000 |
| 20, 40, 80, 160, 320 | 40 MHz | 242 | 010000000, 001000000 |
| 484 | 011000000 |
| 20, 80, 160, 320 | 80 MHz | 242 | 010000000, 001000000, 000100000, 000010000 |
| 484 | 011000000, 000110000 |
| 484+242 | 011100000, 011010000, 010110000, 001110000 |
| 996 | 011110000 |
| 20, 80, 160, 320 | 160 MHz | 242 | 010000000, 001000000, 000100000, 000010000, 000001000, 000000100, 000000010, 000000001 |
| 484 | 011000000, 000110000, 000001100, 000000011 |
| 484+242 | 011100000, 011010000, 010110000, 001110000, 000001110, 000001101, 000001011, 000000111 |
| 996 | 011110000, 000001111 |
| 996+484 | 011111100, 011110011, 011001111, 000111111 |
| 996+484+242 | 011101111, 011011111, 010111111, 001111111, 011111110, 011111101, 011111011, 011110111 |
| 2x996 | 011111111 |
| 80, 160, 320 | 320 MHz | 484 | 110000000, 101000000, 100100000, 100010000, 100001000, 100000100, 100000010, 100000001 |
| 996 | 111000000, 100110000, 100001100, 100000011 |
| 996+484 | 111100000, 111010000, 110110000, 101110000, 100001110, 100001101, 100001011, 100000111 |
| 2x996 | 111110000, 100001111, |
| 2x996+484 | 111111000, 111110100, 111101100, 111011100, 110111100, 101111100, 100111110, 100111101, 100111011, 100110111, 100101111, 100011111 |
| 3x996 | 111111100, 111110011, 111001111, 100111111 |
| 3x996+484 | 111111110, 111111101, 111111011, 111110111, 111101111, 111011111, 110111111, 101111111 |
| 4x996 | 111111111 |

The Feedback Type And Ng and Codebook Size subfields for EHT TB sounding are defined in Table 9-29a (Feedback Type And Ng subfield and Codebook Size subfield encoding for HE TB sounding).

The Feedback Type And Ng and Codebook Size subfields for EHT non-TB sounding are defined in Table 9-29b (Feedback Type And Ng subfield and Codebook Size subfield encoding for HE non-TB sounding).

The Disambiguation subfield is set to 1.

NOTE—Setting the Disambiguation subfield to 1 prevents a non-EHT VHT STA from wrongly identifying its AID in the EHT NDP Announcement frame. The Disambiguation subfield coincides with the MSB of the AID12 subfield of a VHT NDP Announcement frame if the EHT NDP Announcement field is parsed as VHT NDP Announcement frame by a non-EHT VHT STA. The MSB of the AID12 subfield is always 0 since the maximum AID is 2007.

In a broadcast EHT NDP Announcement frame that has more than one STA Info field, the following applies:

— If the Feedback Type And Ng subfield and the Codebook Size subfield indicate SU or MU, the Nc Index subfield indicates the number of columns in the compressed beamforming feedback matrix minus 1, *Nc* – 1.The valid range of Nc Index is from 0 to 7. *(#1639)*

— If the Feedback Type And Ng subfield and the Codebook Size subfield indicate CQI, the Nc Indexsubfield indicates the number of spatial streams in the CQI report minus 1, *Nc* – 1. The valid range of Nc Index is from 0 to 7. *(#1639)*

In an individually addressed EHT NDP Announcement frame with a single STA Info field, the Nc Index *(#1639)* subfield is reserved.

## *Instruction to 11be Editor: Modify texts in the subclause 9.4.1.67a-67d as follows.*

*Underline text is for addition, and strikeout text is for deletion.*

### 9.4.1.67a EHT MIMO Control field

The EHT MIMO Control field is defined in [Figure 9-144b (EHT MIMO Control field format)](#bookmark21).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0   B3 | B4   B7 | B8   B10 | B11 | B12   B13 | B14   B16 |
|  | Nc Index | Nr Index | BW | Grouping | Feedback Type | Reserved |
| Bits | 4 | 4 | 3 | 1 | 2 | 3 |
|  |  |  |  |  |  |  |
|  | B17   B19 | B20 | B21   B29 | B30   B35 | B36 | B37   B39 |
|  | Remaining Feedback Segments | First Feedback Segment | Partial BW Info | Sounding Dialog Token Number | Codebook Information | Reserved |
| Bits | 3 | 1 | 9 | 6 | 1 | 3 |

**Figure 9-144b—EHT MIMO Control field format**

The subfields of the EHT MIMO Control field are defined in [Table 9-91i (EHT MIMO Control field encoding)](#bookmark22).

**Table 9-91i—EHT MIMO Control field encoding**

|  |  |
| --- | --- |
| **Subfield** | **Description** |
| Nc Index | If the Feedback Type subfield indicates SU or MU, the Nc Index subfield indicates the number of columns in the compressed beamforming feedback matrix minus 1, *Nc* – 1*(#1639)*.  If the Feedback Type subfield indicates CQI, the Nc Index subfield indicates the number of spatialstreams, *Nc*, in the CQI report and is set to *Nc* – 1.  The valid range of Nc Index is from 0 to 7. *(#1639)* |
| Nr Index | If the Feedback Type subfield indicates SU or MU, the Nr Index subfield indicates the number of rows in the compressed beamforming feedback matrix minus 1*Nr* – 1*(#1639)*. The value 0 is reserved.  If the Feedback Type subfield indicates CQI, then the Nr Index subfield is reserved.  The valid range of Nr Index is from 1 to 7. *(#1639)* |
| BW | Indicates the channel width used to determine the starting and ending subcarrier indices when interpreting the Partial BW Info subfields. The value of the BW subfield corresponds to the bandwidth of EHT NDP.  Set to 0 for 20 MHz  Set to 1 for 40 MHz  Set to 2 for 80 MHz  Set to 3 for 160 MHz  Set to 4 for 320 MHz |
| Grouping | If the Feedback Type subfield indicates SU or MU, then the Grouping subfield indicates the subcarrier grouping, *Ng*, used for the compressed beamforming feedback matrix:  Set to 0 for *Ng* = 4 Set to 1 for *Ng* = 16  If the Feedback Type subfield indicates CQI, then the Grouping subfield is reserved. |
| Codebook Information | Indicates the size of codebook entries.  If the Feedback Type subfield indicates SU: Set to 0 for 4 bits for  and 2 bits for  Set to 1 for 6 bits for  and 4 bits for   If the Feedback Type subfield indicates MU: Set to 0 for 7 bits for  and 5 bits for  Set to 1 for 9 bits for  and 7 bits for   If the Feedback Type subfield indicates CQI, then the Codebook Information subfield is reserved.  NOTE—The codebook size for MU feedback with *Ng* = 16 is limited to   = 9 7. |
| Feedback Type | Indicate the feedback type: Set to 0 for SU  Set to 1 for MU  Set to 2 for CQI  3 is reserved |
| Remaining Feedback Segments | Indicates the number of remaining feedback segments for the associated EHT Compressed Beamforming/CQI frame:  Set to 0 for the last feedback segment of a segmented report or the only feedback segment of an unsegmented report.  Set to a value between 1 and 7 for a feedback segment that is not the last feedback segment of a segmented report. |
| First Feedback Segment | Set to 1 for the first feedback segment of a segmented report or the only feedback segment of an unsegmented report.  Set to 0 if not the first feedback segment or if the EHT Compressed Beamforming Report field and EHT MU Exclusive Beamforming Report field are not present in the frame.  NOTE—The First Feedback Segment subfield is always set to 0 if the Feedback Type subfield indicates CQI because the EHT Compressed Beamforming/CQI Report frame is always less than 11454 octets in length. |
| Partial BW Info | This field is defined as in Figure 9-61f— Partial BW Info subfield format.  The Resolution bit indicates the feedback resolution bandwidth.  Set to 0 to indicate resolution of 20 MHz if BW subfield is set to 0 to 3.  Set to 1 to indicate resolution of 40 MHz if BW subfield is set to 4.  The Feedback Bitmap indicates each resolution bandwidth that the beamformer is requesting feedback. Each bit in the Feedback Bitmap is set to 1 if the feedback on the corresponding resolution bandwidth is requested, and is set to 0 otherwise. |
| Sounding Dialog Token Number | Set to the same value as the Sounding Dialog Token Number field in the corresponding EHT NDP Announcement frame. |

In an EHT Compressed Beamforming/CQI frame not carrying all or part of an EHT compressed beamforming/CQI report (see 35.5 (EHT sounding protocol) for a description of such a case), the Nc Index, Nr Index, BW, Grouping, Codebook Information, Feedback Type, and Sounding Dialog Token Number subfields are reserved, the First Feedback Segment subfield is set to 0, and the Remaining Feedback Segments subfield is set to 7.

### 9.4.1.67b EHT Compressed Beamforming Report field

The EHT Compressed Beamforming Report field carries the average SNR of each spatial stream and compressed beamforming feedback matrices *V* for use by a transmit beamformer to determine steering matrices *Q* , as described in 10.34.3 (Explicit feedback beamforming) and 19.3.12.3 (Explicit feedback beamforming).

The size of the EHT Compressed Beamforming Report field depends on the values in the EHT MIMO Control field. The EHT Compressed Beamforming Report field contains EHT compressed beamforming report information or successive (possibly zero-length) portions thereof in the case of segmented EHT compressed beamforming/CQI report (see 35.5.4 (Rules for generating segmented feedback) ). EHT compressed beamforming report information is included in the EHT compressed beamforming/CQI report if the Feedback Type subfield in the EHT MIMO Control field indicates SU or MU.

The EHT Compressed Beamforming Report information contains the channel matrix elements indexed, first, by matrix angles in order shown in Table 9-71 (Order of angles in the compressed beamforming feedback matrix when used in a non-S1G band), and second, by data and pilot subcarrier index from lowest frequency to highest frequency. An explanation of how these angles are generated from the beamforming feedback matrix *V* is given in 19.3.12.3.6 (Compressed beamforming feedback matrix), where *Nc* is the number of columns in a compressed beamforming feedback matrix determined by the Nc Index subfield of the EHT MIMO Control field, and *Nr* is the number of rows in a compressed beamforming feedback matrix determined by the Nr Index subfield of the EHT MIMO Control field.

The beamforming feedback matrix *V* is formed by the beamformee as follows. The beamformer transmits an EHT sounding NDP with *NSS* *NDP* spatial streams, where *NSS* *NDP* takes a value between 2 and 8 *(#2228)*. Based on this EHT sounding NDP, the beamformee estimates the *NRX* *BFEE*  *NSS* *NDP* channel, and based on that channel it determines a *Nr*  *Nc* orthogonal matrix *V*, where *Nr* and *Nc* satisfy Equation (9-1). *NRX* *BFEE* is the number of receiver chains used to receive the EHT sounding NDP at the beamformee.

Further restrictions on *Nc* are described in 36.2 (EHT PHY service interface). The angles are quantized as defined in Table 9-74 (Quantization of angles) with *bψ* and *bϕ (#2229)* defined by the Codebook Information field of the EHT MIMO Control field (see [9.4.1.67a (EHT MIMO Control field)](#bookmark20)).

The EHT Compressed Beamforming Report information has the structure and order defined in Table 9-91b (HE Compressed Beamforming Report information), where *Na* is the number of angles used for the compressed beamforming feedback matrix (see Table 9-73 (Order of angles in the compressed beamforming feedback matrix when used in a non-S1G band)).

In Table 9-91b (HE Compressed Beamforming Report information), *Ns* is the number of subcarriers for which a compressed beamforming feedback matrix is sent back to the beamformer. A beamformer or beamformee, depending upon which of the two determines the feedback parameters, reduces *Ns* by using a method referred to as grouping, in which only a single compressed beamforming feedback matrix is reported for each group of *Ng* adjacent subcarriers. *Ns* is a function of the BW, Partial BW Info, and Grouping subfields in the EHT MIMO Control field (see [9.4.1.67a (EHT MIMO Control field)](#bookmark20)).

Subcarrier indices *scidx**i* *i* = 0, ..., *NS*-1 are a concatenation of the subcarrier indices for each 242-tone RU or 996-tone RU in the frequency order, identified by the Partial BW Info subfields together with the BW and Grouping subfields. The subcarrier indices for each 242-tone RU or 996-tone RU are defined in [Table 9-91j (Subcarrier indices when feedback](#bookmark24) [request does not cover the entire 80 MHz segment)](#bookmark24), [Table 9-91k (Subcarrier indices when feedback requestcover the entire 80 MHz segment for Ng = 4)](#bookmark25), and [Table 9-91l (Subcarrier indices when feedback request](#bookmark26) [cover the entire 80 MHz segment for Ng = 16)](#bookmark26) .

The Partial BW Info subfield values are set according to the bandwidth of EHT NDP Announcement frame and the RU/MRU in which the feedback is solicited, see Table 9-X (Settings for BW, Partial BW Info subfield in EHT NDP Announcement frame).

For an EHT NDP Announcement frame of bandwidth 20 MHz or 40 MHz, the subcarrier indices of 242-tone RU for each 20 MHz indicated in Partial BW Info subfield is included in the feedback report.

For an EHT NDP Announcement frame of bandwidth larger than or equal to 80 MHz, in each 80 MHz segment, if Partial BW Info subfield indicates the feedback of the entire 80 MHz, the subcarrier indices of the corresponding 996-tone RU is included in the feedback, otherwise, the subcarrier indices of 242-tone RU for each 20 MHz indicated by Partial BW Info subfield are included in the feedback report.

NOTE 1—This implicitly defines *Ns*.

**Table 9-91j—Subcarrier indices when feedback request does not cover the entire 80 MHz segment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **242-tone RU index** | **20 MHz** | | **40 MHz** | **80 MHz** | **160 MHz** | **320 MHz** |
| 1 | *Ng* = 4 | [–122,  –120:4:–4,  –2, 2,  4:4:120, 122] | [–244:*Ng*:–4] | [–500:*Ng*:  –260] | [–1012:*Ng*:  –772] | [–2036:*Ng*:  –1796] |
| *Ng* = 16 | [–122,  –116:16:–4,  –2, 2,  4:16:116, 122] |
| 2 |  | | [4:*Ng*:244] | [–252:*Ng*:–12] | [–764:*Ng*:  –524] | [–1788:*Ng*:  –1548] |
| 3 |  | |  | [12:*Ng*:252] | [–500:*Ng*:  –260] | [–1524:*Ng*:  –1284] |
| 4 |  | |  | [260:*Ng*:500] | [–252:*Ng*:–12] | [–1276:*Ng*:  –1036] |
| 5 |  | |  |  | [12:*Ng*:252] | [–1012:*Ng*:  –772] |
| 6 |  | |  |  | [260:*Ng*:500] | [–764:*Ng*:  –524] |
| 7 |  | |  |  | [524:*Ng*:764] | [–500:*Ng*:  –260] |
| 8 |  | |  |  | [772:*Ng*:1012] | [–252:*Ng*:–12] |
| 9 |  | |  |  |  | [12:*Ng*:252] |
| 10 |  | |  |  |  | [260:*Ng*:500] |
| 11 |  | |  |  |  | [524:*Ng*:764] |
| 12 |  | |  |  |  | [772:*Ng*:1012] |
| 13 |  | |  |  |  | [1036:*Ng*: 1276] |
| 14 |  | |  |  |  | [1284:*Ng*: 1524] |
| 15 |  | |  |  |  | [1548:*Ng*: 1788] |
| 16 |  | |  |  |  | [1796:*Ng*: 2036] |
| NOTE–:*Ng*: denotes an arithmetic progression in *Ng* increments. | | | | | | |

**Table 9-91k—Subcarrier indices when feedback request cover the entire 80 MHz segment for Ng = 4**

|  |  |  |  |
| --- | --- | --- | --- |
| **996-tone RU index** | **80 MHz** | **160 MHz** | **320 MHz** |
| 1 | [–500:4:–4,  4:4:500] | [–1012:4:–516,  –508:4:-12] | [–2036:4:–1540,  –1532:4:–1036] |
| 2 |  | [12:4:508,  516:4:1012] | [–1012:4:–516,  –508:4:–12] |
| 3 |  |  | [12:4:508,  516:4:1012] |
| 4 |  |  | [1036:4:1532,  1540:4:2036] |

**Table 9-91l—Subcarrier indices when feedback request cover the entire 80 MHz segment for Ng = 16**

|  |  |  |  |
| --- | --- | --- | --- |
| **996-tone RU index** | **80 MHz** | **160 MHz** | **320 MHz** |
| 1 | [–500:16:–260, | [–1012:16:–772, | [–2036:16:–1796, |
|  | –252:16:–12, | –764:16:–524, | –1788:16:–1548, |
|  | –4, 4, | –516, –508, | –1540, –1532, |
|  | 12:16:252, | –500:16:–260, | –1524:16:–1284, |
|  | 260:16:500] | –252:16:–12] | –1276:16:–1036] |
| 2 |  | [12:16:252, | [–1012:16:–772, |
|  | 260:16:500, | –764:16:–524, |
|  | 508, 516, | –516, –508, |
|  | 524:16:764, | –500:16:–260, |
|  | 772:16:1012] | –252:16:–12] |
| 3 |  |  | [12:16:252, |
|  | 260:16:500, |
|  | 508, 516, |
|  | 524:16:764, |
|  | 772:16:1012] |
| 4 |  |  | [1036:16:1276, |
|  | 1284:16:1524, |
|  | 1532, 1540, |
|  | 1548:16:1788, |
|  | 1796:16:2036] |

The Average SNR of Space-Time Stream *i* subfield in Table 9-91b (HE Compressed Beamforming Report information) is an 8-bit 2s complement integer defined in Table 9-77 (Average SNR of Space-Time Stream I subfield).

The *AvgSNRi* in Table 9-77 (Average SNR of Space-Time Stream i subfield) is found by computing the SNR per subcarrier in decibels for the subcarriers identified in [Table 9-91j (Subcarrier indices when feedback request does not cover the entire 80 MHz segment)](#bookmark24), [Table 9-91k (Subcarrier indices when feedback](#bookmark25) [request cover the entire 80 MHz segment for Ng = 4)](#bookmark25), and [Table 9-91l (Subcarrier indices when feedback](#bookmark26) [request cover the entire 80 MHz segment for Ng = 16)](#bookmark26), and then computing the arithmetic mean of those values. Each SNR value per subcarrier in stream *i* (before being averaged) corresponds to the SNR associated with column *i* of the beamforming feedback matrix *V* determined at the beamformee. Each SNR corresponds to the predicted SNR at the beamformee when the beamformer applies all columns of the matrix *V*.

Padding is not present between angles in the EHT compressed beamforming report information, even if they correspond to different subcarriers. If the size of the EHT compressed beamforming report information is not an integer multiple of 8 bits, up to seven 0s are appended to the end of the field to make its size an integer multiple of 8 bits.

### 9.4.1.67c EHT MU Exclusive Beamforming Report field

The EHT MU Exclusive Beamforming Report field carries explicit feedback in the form of delta SNRs. The information in the EHT Compressed Beamforming Report field and the EHT MU Exclusive Beamforming Report field can be used by the transmit MU beamformer to determine the steering matrices *Q*, as described in 36.3.3.1 (DL MU-MIMO).

The size of the EHT MU Exclusive Beamforming Report field depends on the values in the EHT MIMO Control field. The EHT MU Exclusive Beamforming Report field contains EHT MU Exclusive Beamforming Report information or successive (possibly zero-length) portions thereof in the case of segmented EHT compressed beamforming/CQI report (see 35.5.4 (Rules for generating segmented feedback)). EHT MU Exclusive Beamforming Report information is included in the EHT compressed beamforming/CQI report (in addition to EHT compressed beamforming report information) if the Feedback Type subfield in the EHT MIMO Control field indicates MU.

The EHT MU exclusive beamforming report information consists of Delta SNR subfields for each of the spatial streams, 1 to *Nc*, of a subset of subcarriers typically spaced *Ng* apart, where *Ng* is signaled in the Grouping subfield of the EHT MIMO Control field. The subset of subcarriers starts from the lowest frequency subcarrier and continues to the highest frequency subcarrier. The subcarrier indices of the feedback for each Delta SNR subfield are identical to the subcarrier indices for the compressed beamforming feedback matrix *V*.

NOTE—The feedback subcarrier spacings are mostly equal to *Ng*, but there are a few exceptions, generally around the RU edge and the DC tone, where extra feedback subcarriers are added to improve the channel interpolation/extrapolation quality.

No padding is present between *SNRk* *i* in the EHT MU Exclusive Beamforming Report field, even if they

correspond to different subcarriers. The subset of subcarriers included is determined by the values of thePartial BW Info and Grouping subfields of the EHT MIMO Control field. For each subcarrier included, the deviation in decibels of the SNR of that subcarrier for each column of *V* relative to the average SNR of the corresponding spatial stream is computed using Equation (9-2) except that *k* is the subcarrier index in the range *scidx*0  *scidx**Ns* – 1 and *SNRi* is the average SNR of spatialstream *i* reported in the Average SNR of Space-Time Stream *i* field of the EHT Compressed Beamforming Report Information field.

The EHT MU Exclusive Beamforming Report information has the structure and order defined in Table 9-91f (HE MU Exclusive Beamforming Report information).

In Table 9-91f (HE MU Exclusive Beamforming Report information), *Ns* and *scidx*() are defined in [9.4.1.67b (EHT Compressed Beamforming Report field)](#bookmark23).

### 9.4.1.67d EHT CQI Report field

The EHT CQI Report field carries the per-RU average SNRs of each spatialstream, where each per-RU average SNR is the arithmetic mean of the SNR in decibels over a 26-tone RU for which the feedback is being requested. The EHT CQI Report field contains information about the quality of the link.

The size of the EHT CQI Report field depends on the values in the EHT MIMO Control field. The EHT CQI Report field contains EHT CQI report information. EHT CQI Report information is included in the EHT compressed beamforming/CQI report if the Feedback Type subfield in the EHT MIMO Control field indicates CQI feedback.

The EHT CQI Report field has the structure and order defined in Table 9-91f (HE CQI Report information).

*Ncqi* is the number of RU indices for which the CQI report is sent back to the beamformer. *Ncqi* equals 9 times the number of 1s from B1 to B8 of Partial BW Info subfield when B0 is set to 0 and *Ncqi* equals 18 times the number of 1s from B1 to B8 of Partial BW Info subfield when B0 is set to 1. *(#1641)* The 26-tone RU subcarrier indices for 20 MHz, 40 MHz, 80 MHz, 160 MHz, and 320 MHz are defined in Table 27-7 (Data and pilot subcarrier indices for RUs in a 20 MHz HE PPDU and in a non-OFDMA 20 MHz HE PPDU), Table 27-8 (Data and pilot subcarrier indices for RUs in a 40 MHz HE PPDU and in a non-OFDMA 40 MHz HE PPDU), Table 36-5 (Data and pilot subcarrier indices for RUs in an 80 MHz EHT PPDU), Table 36-6 (Data and pilot subcarrier indices for RUs in a 160 MHz EHT PPDU), and Table 36-7 (Data and pilot subcarrier indices for RUs in a 320 MHz EHT PPDU), respectively. 26-tone RUs which are not defined, i.e. RU 19, RU 56, RU 93 and RU 130 are not included the EHT CQI Report field. *(#2941)*

The Average SNR of space-time stream *i* for the RU index *k* subfield in Table 9-91f (HE CQI Report information) is a 6-bit 2s complement integer whose definition is shown in Table 9-91h (Average SNR of RU index k for space-time stream i subfield).

The *AvgSNRk* *i* in Table 9-91h (Average SNR of RU index k for space-time stream i subfield) is found by computing the arithmetic mean of the SNR per subcarrier in decibels for spatialstream *i* over the subcarriers in RU index *k* for which the feedback is being requested. The SNR per subcarrier calculation is defined in [9.4.1.67b (EHT Compressed Beamforming Report field)](#bookmark23).

Padding is not present between per-RU average SNRs of each spatialstream information, even if they correspond to different RUs and spatialstreams. If the size of the EHT CQI report information is not an integer multiple of 8 bits, up to seven 0s are appended to the end of the field to make its size an integer multiple of 8 bits.

## *Instruction to 11be Editor: Modify texts in the subclause 26.10 as follows.*

*Underline text is for addition, and strikeout text is for deletion.*

### 10.23 HCF

### 10.23.2 HCF contention based channel access (EDCA)

### 10.23.2.8 Multiple frame transmission in an EDCA TXOP

***Change the first paragraph as follows:***

A frame exchange, in the context of multiple frame transmission in an EDCA TXOP, may be one of the following:

* A frame not requiring immediate acknowledgment (such as a group addressed frame or a frame transmitted with an ack policy that does not require immediate acknowledgment) or an A-MPDU containing only such frames
* A frame requiring immediate acknowledgment (such as an individually addressed frame transmitted with an ack policy that requires immediate acknowledgment) or an A-MPDU containing at least one such frame, followed after SIFS by a corresponding acknowledgment frame
* A triggering frame or an A-MPDU containing at least one such frame, followed after SIFS by an HE TB PPDU where the HE TB PPDU is optionally followed after SIFS by an acknowledgment
* Either
  + a VHT NDP Announcement frame followed after SIFS by a VHT NDP followed after SIFS by an A-MPDU containing one or more VHT Compressed Beamforming frames, or
  + a Beamforming Report Poll frame followed after SIFS by an A-MPDU containing one or more VHT Compressed Beamforming frames, or
  + an HE NDP Announcement frame followed after SIFS by an HE sounding NDP followed after SIFS by a PPDU containing one or more HE Compressed Beamforming/CQI frames, or
  + a broadcast HE NDP Announcement frame followed after SIFS by an HE sounding NDP followed after SIFS by a BFRP Trigger frame followed by HE TB PPDUs, or
  + a BFRP Trigger frame followed after SIFS by an HE TB PPDU containing one or more HE Compressed Beamforming/CQI frames, or
  + an EHT NDP Announcement frame followed after SIFS by an EHT sounding NDP followed after SIFS by a PPDU containing one or more EHT Compressed Beamforming/CQI frames, or
  + a broadcast EHT NDP Announcement frame followed after SIFS by an EHT sounding NDP followed after SIFS by a BFRP Trigger frame followed by HE TB PPDU or *(#1103)* EHT TB PPDUs, or
  + a BFRP Trigger frame followed after SIFS by an HE TB PPDU or *(#1103)* EHT TB PPDU containing one or more EHT Compressed Beamforming/CQI frames

## *Instruction to 11be Editor: Modify texts in the subclause 26.10 as follows.*

*Underline text is for addition, and strikeout text is for deletion.*

### 26.10 Spatial reuse operation

### 26.10.2 OBSS PD-based spatial reuse operation

### 26.10.2.2 General operation with non-SRG OBSS PD level

***Change the last item of the first paragraph as follows:***

If the PHY of a STA issues a PHY-CCA.indication(BUSY) followed by a PHY-RXSTART.indication due to a PPDU reception then the STA’s MAC sublayer may a) issue a PHY-CCARESET.request primitive before the end of the PPDU and not update its basic NAV timer based on the PPDU or may b) not update its basic NAV timer based on the PPDU if all the following conditions are met:

* The STA has not set the TXVECTOR parameter …
* …
* The PPDU is not one of the following:
* A non-HE PPDU that carries a frame where the RA field is equal to the STA MAC address
* A non-HE PPDU that carries a Public Action frame
* A non-HE PPDU that carries an ~~VHT/HE~~ *(#1094)* NDP Announcement frame or Fine Timing Measurement frame
* A non-HE NDP

### 26.10.2.3 General operation with SRG OBSS PD level

***Change the last item of the first paragraph as follows:***

If the PHY of a STA issues a PHY-CCA.indication(BUSY) followed by a PHY-RXSTART.indication due to a PPDU reception then the STA’s MAC sublayer may a) issue a PHY-CCARESET.request primitive before the end of the PPDU and not update its basic NAV timer based on the PPDU or may b) not update its basic NAV timer based on the PPDU if all the following conditions are met:

* The received PPDU is an SRG PPDU …
* The PPDU is not one of the following:
* A non-HE PPDU that carries a frame where the RA field is equal to the STA MAC address
* A non-HE PPDU that carries a Public Action frame
* A non-HE PPDU that carries an ~~VHT/HE~~ NDP *(#1094)* Announcement frame or Fine Timing Measurement frame
* A non-HE NDP

## *Instruction to 11be Editor: Add texts in the subclause 35.5 as follows.*

### 35.5 EHT sounding protocol

### 35.5.1 General

Transmit beamforming and DL MU-MIMO require knowledge of the channel state to compute a steering matrix that is applied to the transmit signal to optimize reception at one or more receivers. EHT STAs use the EHT sounding protocol to determine the channel state information. The EHT sounding protocol provides explicit feedback mechanisms, defined as EHT non-trigger-based (non-TB) sounding and EHT trigger-based (TB) sounding, where the EHT beamformee measures the channel using a training signal (i.e., an EHT sounding NDP) transmitted by the EHT beamformer and sends back a transformed estimate of the channel state. The EHT beamformer uses this estimate to derive the steering matrix.

The EHT beamformee returns an estimate of the channel state in an EHT compressed beamforming/CQI report carried in one or more EHT Compressed Beamforming/CQI frames. There are three types of EHT compressed beamforming/CQI report:

* SU feedback: The EHT compressed beamforming/CQI report consists of an EHT Compressed Beamforming Report field
* MU feedback: The EHT compressed beamforming/CQI report consists of an EHT Compressed Beamforming Report field and EHT MU Exclusive Beamforming Report field
* CQI feedback: The EHT compressed beamforming/CQI report consists of an EHT CQI Report field

NOTE—Use of EHT TB sounding does not necessarily imply MU feedback. EHT TB sounding is also used to obtain SU feedback and CQI feedback.

The EHT compressed beamforming/CQI report is carried in a single EHT Compressed Beamforming/CQI frame if the resulting frame is less than or equal to 11 454 octets in length (see 35.5.3 (Rules for EHT sounding protocol sequences)). Otherwise, the EHT beamforming feedback is segmented and each segment is carried in an EHT Compressed Beamforming/CQI frame.

An EHT beamformer shall support a maximum MPDU length for the EHT compressed beamforming/CQI report that is the minimum of 11 454 octets and the maximum length of the EHT compressed beamforming/CQI report that the EHT beamformer intends to solicit from its EHT beamformees.

### 35.5.2 EHT sounding protocol(#24009)

An SU beamformer is an EHT STA that sets the SU Beamformer subfield in the EHT PHY Capabilities Information field in(#Ed) the EHT Capabilities element it transmits to 1.

An SU beamformee is an EHT STA that sets the SU Beamformee subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits to 1. A non-AP EHT STA shall set the SU Beamformee subfield to 1. An EHT AP may set the SU Beamformee subfield to 1.

An MU beamformer is an EHT AP that sets the MU Beamformer subfield in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits to 1. An EHT AP that indicates support for 4 or more spatial streams in the Tx EHT-MCS Map ≤ 80 MHz subfield in the Supported EHT-MCS And NSS field in the EHT Capabilities element shall set the MU Beamformer subfield to 1. A non-AP EHT STA shall set the MU Beamformer subfield to 0. An MU beamformer is also an SU beamformer and shall set the SU Beamformer subfield to 1.

NOTE—A non-AP STA might use the setting of the MU Beamformer subfield to determine the AP with which it will associate.(#24504)

A non-AP EHT STA shall support operation as an MU beamformee. An EHT AP does not support operation as an MU beamformee.

The term EHT beamformer refers to both the SU beamformer and MU beamformer. The term EHT beamformee refers to both the SU beamformee and MU beamformee.

The type of feedback (SU, MU or CQI) solicited by an EHT beamformer from an EHT beamformee is indicated in the Feedback Type And Ng and Codebook subfields in the STA Info field identifying the EHT beamformee in the EHT NDP Announcement frame as defined in Table 9-31a (Feedback Type And Ng subfield and Codebook Size subfield encoding for HE TB sounding) and Table 9-31b (Feedback Type And Ng subfield and Codebook Size subfield encoding for HE non-TB sounding)(#24511).

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 EHT NDP Announcement frame and the EHT NDP frame shall be same.

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 partial bandwidth or full bandwidth SU feedback from an SU beamformee in an EHT non-TB sounding sequence. In partial bandwidth non-TB sounding sequence case, the Puncturing Channel Information fields in U-SIG shall indicate the same puncturing pattern as 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 partial bandwidth or full bandwidth MU feedback from an MU beamformee in an EHT TB sounding sequence. 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.

An EHT beamformer shall not send an EHT NDP Announcement frame that initiates an EHT TB sounding sequence with a STA Info field identifying an EHT beamformee if the STA Info field and the PHY Capabilities Information field in the EHT Capabilities element most recently received from the EHT beamformee meet any of the following conditions (see Table 9-31a (Feedback Type And Ng subfield and Codebook Size subfield encoding for HE TB sounding)):

* The Feedback Type And Ng and Codebook Size subfield in the STA Info field indicates SU and *Ng* = 16, and the Ng = 16 SU Feedback subfield in the EHT PHY Capabilities Information field is 0
* The Feedback Type And Ng and Codebook Size subfield in the STA Info field indicates MU and *Ng* = 16, and the Ng = 16 MU Feedback subfield in the EHT PHY Capabilities Information field is 0
* The Feedback Type And Ng and Codebook Size subfield in the STA Info field indicates SU, the Codebook Size subfield indicates codebook resolution (ϕ, ψ) = {4, 2} and the Codebook Size (ϕ, ψ) ={4, 2} SU Feedback subfield in the EHT PHY Capabilities Information field is 0
* The Feedback Type And Ng and Codebook Size subfield in the STA Info field indicates MU, the Codebook Size subfield in the STA Info field indicates codebook resolution (ϕ, ψ) = {7, 5} and the Codebook Size (ϕ, ψ) ={7, 5} MU Feedback subfield in the EHT PHY Capabilities Information field is 0
* The Feedback Type And Ng and Codebook Size subfield in the STA Info field indicates CQI and the Triggered CQI Beamforming Feedback subfield in the EHT PHY Capabilities Information field is 0
* The Feedback Type And Ng and Codebook Size subfield indicates SU and the Triggered SU Beamforming Feedback subfield in the EHT PHY Capabilities Information field is 0

An EHT beamformee indicates the maximum number of EHT-LTF symbols it can receive in a 20 MHz, 40 MHz or 80 MHz EHT sounding NDP in the Beamformee SS ≤ 80 MHz subfield in the PHY Capabilities Information field in the EHT Capabilities element it transmits.

An EHT beamformee shall set the Beamformee SS ≤ 80 MHz subfield to indicate a maximum number of EHT-LTF symbols of 4 or greater.

An EHT beamformee indicates the maximum number of EHT-LTF symbols it can receive in a 160 MHz EHT sounding NDP in the Beamformee SS = 160 MHz subfield in the PHY Capabilities Information field in the EHT Capabilities element it transmits.

An EHT beamformee indicates the maximum number of EHT-LTF symbols it can receive in a 320 MHz EHT sounding NDP in the Beamformee SS = 320 MHz subfield in the PHY Capabilities Information field in the EHT Capabilities element it transmits.

An EHT beamformer shall not transmit a 20 MHz, 40 MHz or 80 MHz EHT sounding NDP with a TXVECTOR parameter NUM\_STS that is greater than the maximum number of EHT-LTF symbols indicated in the Beamformee SS ≤ 80 MHz subfield of any STA identified by a STA Info field in the preceding EHT NDP Announcement frame.

An EHT beamformer shall not transmit a 160 MHz EHT sounding NDP with a TXVECTOR parameter NUM\_STS that is greater than the maximum number of EHT-LTF symbols indicated in the Beamformee SS = 160 MHz subfield of any STA identified by a STA Info field in the preceding EHT NDP Announcement frame.

An EHT beamformer shall not transmit a 320 MHz EHT sounding NDP with a TXVECTOR parameter NUM\_STS that is greater than the maximum number of EHT-LTF symbols indicated in the Beamformee SS = 320 MHz subfield of any STA identified by a STA Info field in the preceding EHT NDP Announcement frame.

An EHT beamformer indicates the maximum number of EHT-LTF symbols it might transmit in a 20 MHz, 40 MHz or 80 MHz EHT sounding NDP in the Number Of Sounding Dimensions ≤ 80 MHz subfield.

An EHT beamformer indicates the maximum number of EHT-LTF symbols it might transmit in a 160 MHz EHT sounding NDP in the Number Of Sounding Dimensions = 160 MHz subfield.

An EHT beamformer indicates the maximum number of EHT-LTF symbols it might transmit in a 320 MHz EHT sounding NDP in the Number Of Sounding Dimensions = 320 MHz subfield.

An EHT beamformer shall not transmit a 20 MHz, 40 MHz or 80 MHz EHT sounding NDP where the number of EHT-LTF symbols exceeds the value indicated in the Number Of Sounding Dimensions ≤ 80 MHz subfield.

An EHT beamformer shall not transmit a 160 MHz EHT sounding NDP where the number of EHT-LTF symbols exceeds the value indicated in the Number Of Sounding Dimensions = 160 MHz subfield.

An EHT beamformer shall not transmit a 320 MHz EHT sounding NDP where the number of EHT-LTF symbols exceeds the value indicated in the Number Of Sounding Dimensions = 320 MHz subfield.

An EHT beamformer may solicit partial BW feedback from one or more EHT beamformees with operating channel width smaller than the bandwidth of the EHT NDP Announcement frame and sounding NDP.

A 320 MHz EHT beamformer shall not send a 320 MHz EHT NDP Announcement frame solicit partial BW feedback from an EHT beamformee with 20 MHz operating channel width.

An EHT NDP Announcement frame of bandwidth larger than 40 MHz shall not include an EHT beamformee with 40 MHz operating channel width.

A 20 MHz operating EHT beamformee may support partial BW feedback solicited with an EHT NDP Announcement frame and an EHT sounding NDP of bandwidth of 40 MHz, 80 MHz and 160 MHz.

A 40 MHz operating EHT beamformee shall support partial BW feedback solicited with an EHT NDP Announcement frame and an EHT sounding NDP of 40 MHz bandwidth.

An 80 MHz operating EHT beamformee shall support partial BW feedback solicited with an EHT NDP Announcement frame and an EHT sounding NDP of bandwidth of 40 MHz, 80 MHz, 160 MHz and 320 MHz.

A 160 MHz operating EHT beamformee shall support partial BW feedback solicited with an EHT NDP Announcement frame and an EHT sounding NDP of bandwidth of 40 MHz, 80 MHz, 160 MHz and 320 MHz.

A 320 MHz operating EHT beamformee shall support partial BW feedback solicited with an EHT NDP Announcement frame and an EHT sounding NDP of bandwidth of 40 MHz, 80 MHz, 160 MHz and 320 MHz.

### 35.5.3 Rules for EHT sounding protocol sequences

(#24010)An EHT non-TB sounding sequence is initiated by an EHT beamformer with an individually addressed EHT NDP Announcement frame comprising exactly one STA Info field, followed after SIFS by an EHT sounding NDP. The EHT beamformee responds after SIFS with an EHT Compressed Beamforming/CQI frame.

The AID11 subfield of the STA Info field shall be set to the AID of the STA identified by the RA field of the EHT NDP Announcement frame, or to 0 if the STA identified by the RA field is a mesh STA, AP or IBSS STA.

An example of an EHT non-TB sounding sequence with a single EHT beamformee is shown in Figure X1 (An illustration of EHT non-TB sounding).

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|  |
| Figure X1 - An illustration of EHT non-TB sounding(#24010) |

An EHT beamformer that initiates the EHT non-TB sounding sequence shall transmit the EHT NDP Announcement frame with a single STA Info field, the STA Info field having a value in the AID11 field other than 2047(#24474) and with the AID11 field in that STA Info field set to the AID of the STA identified by the RA field or to 0 if the STA identified by the RA field is a mesh STA, AP or IBSS member STA.

An EHT beamformer may initiate an EHT non-TB sounding sequence with an EHT beamformee to solicit SU or CQI feedback.

(#24012)An EHT TB sounding sequence is initiated by an EHT beamformer with a broadcast EHT NDP Announcement frame with two or more STA Info fields, followed after a SIFS by an EHT sounding NDP followed after a SIFS by a BFRP Trigger frame. Each EHT beamformee responds after a SIFS with an EHT Compressed Beamforming/CQI frame.

An example of an EHT TB sounding sequence with more than one EHT beamformee is shown in Figure X2 (An illustration of EHT TB sounding).

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|  |
| Figure X2 An illustration of EHT TB sounding(#24012) |

An EHT beamformer that initiates an EHT TB sounding sequence shall transmit the EHT NDP Announcement frame with two or more STA Info fields and the RA field set to the broadcast address.

An EHT beamformer may initiate an EHT TB sounding sequence to solicit SU, MU or CQI feedback.

An EHT beamformer may initiate an EHT TB sounding sequence to solicit a feedback variant only if the feedback variant is computed based on parameters supported by the EHT beamformee; otherwise the EHT beamformer shall not solicit a feedback variant computed based on parameters not supported by the EHT beamformee (see 35.5.2 (EHT sounding protocol)).

(#24013)An EHT AP with dot11MultiBSSIDImplemented equal to true shall not send an EHT NDP Announcement frame with the TA field set to the transmitted BSSID to a non-AP STA that is associated with an AP corresponding to a nontransmitted BSSID(#24108) in the multiple BSSID set unless the AP has received from the non-AP STA an EHT Capabilities element with the Rx Control Frame To MultiBSS subfield in the EHT MAC Capabilities Information field equal to 1.

An AP that transmits an EHT NDP Announcement frame identifying EHT STAs shall set the TA field of the frame to the MAC address of the AP, unless dot11MultiBSSIDImplemented is true and the EHT NDP Announcement frame identifies STAs from at least two different BSSs of the multiple BSSID set, in which case, the AP shall set the TA field of the frame to the transmitted BSSID. If the EHT NDP Announcement frame is transmitted in a non-HT duplicate PPDU then the TA field of the EHT NDP Announcement frame is a bandwidth signaling TA (see 10.6.6.6 (Channel Width selection for Control frames)).

An EHT beamformer that transmits an EHT NDP Announcement frame to an EHT beamformee that is an AP, TDLS peer STA, mesh STA or IBSS STA, shall include one STA Info field in the EHT NDP Announcement frame and shall set the AID11 field in the STA Info field of the frame to 0.

An EHT beamformer that is an AP and that transmits an EHT NDP Announcement frame to one or more EHT beamformees shall set the AID11 field in the STA Info field identifying a non-AP STA to the 11 LSBs of the AID of the non-AP STA.

An EHT NDP Announcement frame shall not include multiple STA Info fields that have the same value in the AID11 subfield.

In an EHT TB sounding sequence, a STA Info field in the EHT NDP Announcement frame that solicits SU or MU feedback indicates the subcarrier grouping, *Ng*, codebook size and the number of columns, *Nc*, to be used by the EHT beamformee identified by the STA Info field for the generation of the SU or MU feedback.

In an EHT non-TB sounding sequence where the STA Info field in the EHT NDP Announcement frame solicits SU feedback, the subcarrier grouping, *Ng*, codebook size and the number of columns, *Nc*, used for the generation of the SU feedback are determined by the EHT beamformee. In an EHT TB sounding sequence, a STA Info field in the EHT NDP Announcement frame that solicits CQI feedback indicates the *Nc* to be used by the EHT beamformee identified by the STA Info field for the generation of the CQI feedback.

In an EHT non-TB sounding sequence where the STA Info field in the EHT NDP Announcement frame solicits CQI feedback, the *Nc* used for the generation of the CQI feedback is determined by the EHT beamformee.

An EHT beamformer that has initiated an EHT TB sounding sequence may send another BFRP Trigger frame in the same TXOP as shown in Figure X2 (An illustration of EHT TB sounding). The EHT beamformer uses the additional BFRP Trigger frames to solicit EHT compressed beamforming/CQI reports from EHT beamformees not addressed in a previous BFRP Trigger frame. An EHT beamformer shall not transmit a BFRP Trigger frame that identifies a STA identified in the EHT NDP Announcement frame of an EHT TB sounding sequence unless it is in the same TXOP as the EHT TB sounding sequence.

An EHT beamformer that transmits an EHT NDP Announcement frame as part of an EHT TB sounding sequence shall set the Nc Index *(#1639)* subfieldof the STA Info field to indicate a value less than or equal to the minimum of:

* The maximum number of supported spatial streams according to the corresponding EHT beamformee’s Rx EHT-MCS Map ≤ 80 MHz, Rx EHT-MCS Map = 160 MHz, and Rx EHT-MCS Map = 320 MHz subfields in the Supported EHT-MCS And NSS Set field in(#Ed) the EHT Capabilities element sent by the EHT beamformee.
* The maximum number of supported spatial streams according to the Rx NSS subfield value in the most recently received Operating Mode Notification frame, Operating Mode Notification element with the Rx NSS Type subfield equal to 0, or OM Control subfield sent by the corresponding EHT beamformee (see 35.X (Operating mode indication)).
* The maximum *Nc* indicated by the Max Nc subfield in the EHT PHY Capabilities Information field in(#Ed) the EHT Capabilities element sent by the EHT beamformee.

An EHT beamformer that transmits an EHT NDP Announcement frame shall set the Partial Bandwidth Info subfield in a STA Info field to indicate the feedback subcarrier indices, of the solicited EHT compressed beamforming/CQI report (see 9.3.1.19 (VHT/HE/EHT NDP Announcement frame format)).

The EHT beamformer shall set the TXVECTOR parameter CH\_BANDWIDTH or CH\_BANDWIDTH\_IN\_NON\_HT, the Partial BW Info subfield of the EHT NDP Announcement frame, depending on the operating channel width, as defined in Table 9-X (Settings for BW, Partial BW Info subfield in EHT NDP Announcement frame).

The EHT beamformer shall use a lowest *scidx(0)*, which is the lower bound of the *scidx(0)* indicated by Partial BW Info subfield of a STA Info field that is equal to the maximum of:

* The minimum subcarrier index located within the channel width indicated in the VHT Operation Information field of either the HE Operation element or the VHT Operation element, whichever is present, and within the channel width indicated in the HT Operation element
* The minimum subcarrier index located within the channel width indicated in the most recently received Operating Mode Notification frame, Operating Mode Notification element with the Rx NSS Type subfield equal to 0, or OM Control subfield sent by the corresponding EHT beamformee (see 35.X (Operating mode indication))

The EHT beamformer shall use a highest *scidx(Ns*– 1*)*, which is the upper bound of the *scidx(Ns*– 1*)* indicated by Partial BW Info subfield of a STA Info field that is equal to the minimum of:

* The maximum subcarrier index located within the channel width indicated in the VHT Operation Information field of either the HE Operation element or the VHT Operation element, whichever is present, and within the channel width indicated in the HT Operation element
* The maximum subcarrier index located within the channel width indicated in the most recently received Operating Mode Notification frame, Operating Mode Notification element with the Rx NSS Type subfield equal to 0, or OM Control field sent by the corresponding EHT beamformee (see 35.X (Operating mode indication))

(#24511)(#24511)In an EHT non-TB sounding sequence soliciting SU feedback, B26 (in the Feedback Type And Ng subfield), the Codebook Size subfield, and the Nc Index *(#1639)* subfield in the STA Info field of the EHT NDP Announcement frame are reserved.

In an EHT non-TB sounding sequence soliciting CQI feedback, the Nc Index *(#1639)* subfield in an EHT NDP Announcement frame is reserved.

An EHT beamformee that receives an EHT NDP Announcement frame soliciting SU feedback as part of an EHT non-TB sounding sequence shall generate an EHT compressed beamforming/CQI report for SU feedback with *Nc* in the range 1 to 8, *Ng* = 4 or *Ng* = 16, and codebook size (ϕ, ψ) = {4, 2} or (ϕ, ψ) = {6, 4}. The EHT beamformee shall transmit the EHT compressed beamforming/CQI report a SIFS after the EHT sounding NDP.

An EHT beamformee that receives an EHT NDP Announcement frame soliciting CQI feedback as part of an EHT non-TB sounding sequence shall generate an EHT compressed beamforming/CQI report for CQI feedback with *Nc* determined by the EHT beamformee.

An EHT beamformee that receives an EHT NDP Announcement frame soliciting CQI feedback as part of an EHT TB sounding sequence shall generate an EHT compressed beamforming/CQI report for CQI feedback with *Nc* determined by the EHT beamformer. An EHT beamformee that receives an EHT NDP Announcement frame from an EHT beamformer with which it is associated and that contains the EHT beamformee’s MAC address in the RA field (indicating a non-TB sounding sequence) and also receives an EHT sounding NDP a SIFS after the EHT NDP Announcement frame shall transmit its EHT compressed beamforming/CQI report a SIFS after the EHT sounding NDP. The TXVECTOR parameter CH\_BANDWIDTH for the PPDU containing the EHT compressed beamforming/CQI report shall be set to indicate a bandwidth not wider than that indicated by the RXVECTOR parameter CH\_BANDWIDTH of the EHT sounding NDP.

An EHT beamformee that receives an EHT NDP Announcement frame as part of an EHT TB sounding sequence with a STA Info field identifying it soliciting SU or MU feedback shall generate an EHT compressed beamforming/CQI report using the feedback type, *Ng*, codebook size, and *Nc* indicated in the STA Info field. If the EHT beamformee then receives a BFRP Trigger frame with a matching STA Info field, the EHT beamformee transmits an HE/EHT TB PPDU *(#1103)* containing the EHT compressed beamforming/CQI report following the rules defined in 26.5.2.3 (Non-AP STA behavior for UL MU operation). If the EHT NDP Announcement frame has the TA field set to the transmitted BSSID, and the EHT beamformee is a non-AP STA associated with an AP corresponding to a nontransmitted BSSID(#24108) that supports receiving Control frames with TA field set to the transmitted BSSID, then the EHT compressed beamforming/CQI report sent in response shall have the RA field set to as defined in 26.5.2.3.5 (RA field for frames carried in an HE TB PPDU).

NOTE—A non-AP EHT beamformee that transmits an OM Control subfield with the UL MU Disable field set to 1 does not respond to BFRP Trigger frames (see 35.X (Operating mode indication)).

An EHT beamformee that is a non-AP STA that transmits an EHT Compressed Beamforming/CQI Report shall set the Partial BW Info subfield of the EHT MIMO Control field to indicate the range of subcarriers for which compressed beamforming/CQI information is provided. The Partial BW Info subfield shall be set to the value of the Partial BW Info subfield of NDP Announcement frame for the EHT beamformee.

An EHT beamformee that transmits EHT compressed beamforming feedback shall include neither the EHT Compressed Beamforming Report information nor the EHT MU Exclusive Beamforming Report information if the transmission duration of the PPDU carrying the EHT Compressed Beamforming Report information and any EHT MU Exclusive Beamforming Report information would exceed the maximum PPDU duration.(#24496)

The Sounding Dialog Token Number field in the EHT MIMO Control field shall be set to the same value as the Sounding Dialog Token Number field in the corresponding EHT NDP Announcement frame.

An EHT beamformer that sends a BFRP Trigger frame shall set the Feedback Segment Retransmission Bitmap fields of the BFRP Trigger frame to all 1s.

NOTE—The BFRP Trigger frame contains one or more User Info fields, each of which identifies an EHT beamformee.

The SNR per subcarrier computation should be done on at least 4 subcarriers in a 26-tone RU.

### 35.5.4 Rules for generating segmented feedback

If the EHT compressed beamforming/CQI report solicited by the EHT beamformer would result in an EHT Compressed Beamforming/CQI frame that exceeds 11 454 octets in length, then the EHT compressed beamforming/CQI report shall be split into up to 8 feedback segments. Each feedback segment shall be included in a separate EHT Compressed Beamforming/CQI frame and shall contain successive portions of the EHT compressed beamforming/CQI report. Each feedback segment shall be of equal length except the last feedback segment that may be smaller. Each EHT Compressed Beamforming/CQI frame that includes a feedback segment that is not the last feedback segment shall have a length of 11 454 octets. Each feedback segment is identified by the value of the Remaining Feedback Segments subfield and the First Feedback Segment subfield in the EHT MIMO Control field as defined in 9.4.1.67a (EHT MIMO Control field); the other nonreserved subfields of the EHT MIMO Control field shall be the same for all feedback segments. All feedback segments shall be sent in a single A-MPDU contained in a PPDU and shall be included in the A-MPDU in the descending order of the Remaining Feedback Segments subfield values.

An EHT beamformer that sends a BFRP Trigger frame to retrieve an EHT compressed beamforming/CQI report from an EHT beamformee, shall solicit all possible feedback segments by setting all of the bits in the Feedback Segment Retransmission Bitmap subfield to 1 in the User Info field identifying the EHT beamformee.

An EHT beamformer, that fails to receive some or all of the feedback segments of the EHT compressed beamforming/CQI report from the EHT beamformee, shall not use a BFRP Trigger frame to request retransmission of the feedback segments. In this case, the EHT beamformer may repeat the entire sounding sequence.

### 35.5.5 EHT sounding NDP transmission

The TXVECTOR parameters for an EHT sounding NDP shall be set as follows:

* FORMAT is set to EHT\_MU
* APEP\_LENGTH is set to 0
* EHT\_LTF\_TYPE is set to either 2xEHT-LTF or 4xEHT-LTF
* If EHT\_LTF\_TYPE is 2xEHT-LTF, then GI\_TYPE is set to either 0u8s\_GI or 1u6s\_GI
* If EHT\_LTF\_TYPE is 4xEHT-LTF, then GI\_TYPE is set to 3u2s\_GI
* NUM\_STS indicates two or more spatial streams if the Feedback Type field in the EHT MIMO Control field of the preceding EHT NDP Announcement frame indicates either SU or MU, or one or more spatial streams if the Feedback Type field in the EHT MIMO Control field of the preceding EHT NDP Announcement frame indicates CQI. See below for additional constraints on NUM\_STS.
* CH\_BANDWIDTH is set to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding EHT NDP Announcement frame.
* SPATIAL\_REUSE is set to PSR\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED (see 26.11.6 (SPATIAL\_REUSE))
* BSS\_COLOR is set to the value indicated in the BSS Color subfield of the HE Operation element received or transmitted by the EHT AP
* TXOP\_DURATION set to either 127 or a value defined in Equation (X)

(X)

where

*D*EHT\_NDPA is the value of the Duration/ID field in the MAC header of the preceding EHT NDP Announcement frame

TXTIME is the transmission time of an EHT sounding NDP defined in Equation (36-94)

The Supported EHT-MCS and NSS Set field in(#Ed) the EHT Capabilities element transmitted by the transmitter and the receiver of the EHT sounding NDP do not affect the values used for the NUM\_STS parameter for the TXVECTOR of an EHT sounding NDP.

The destination of an EHT sounding NDP is equal to the RA of the immediately preceding EHT NDP Announcement frame.

The source of an EHT sounding NDP is equal to the TA of the immediately preceding EHT NDP Announcement frame.

---- End of text proposal ----

