IEEE P802.11
Wireless LANs

|  |
| --- |
| 11be D2.0 Cooment Resolution 20 MHz Only STA |
| Date: September 2022 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Liwen Chu | NXP |  |  |  |
| Rakesh.Taori | Infineon |  |  |  |
| Sai Nandagopalan | Synaptics |  |  |  |
| Manish Kumar | NXP |  |  |  |

Abstract

Proposed draft text for enhancements to TID mapping.

The submission proposes text changes to resolve the following CIDs

13944. 13945, 12161

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2022-09-25 | 0 | Initial draft |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Line** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 13944 | 228 | 48 | The current specifications do not offer a mechanism to distinguish a 20 MHz only non-AP STA from a regular non-AP STA | Add signaling in the EHT capabiliites to enable the capability to distinctly identify a 20 Mhz only non-AP STA from a regular non-AP STA. | RevisedDiscussion: in 5/6GHz band, the Supported Channel Width field can be used to indicate whether a non-AP STA is 20 MHz only STA. However in 2.4GHz band, the typical implementation is 20 MHz STA that can support more mandatory features than 20MHz-only STA for IoT market.There is a requirement to differentiate normal 20MHz STA and 20MHz only STA.  |
| 13945 | 240 | 25 | The IoT Market segment is seeing a growing number of applications with markedly different characteristics. It is challenging to address all these applications with a single set of capabilities. It would be beneficial to define a separate capabilities information field for indicating the capabilities of a 20 Mhz only STA | Add a subclause (for instance "20 MHz only Capabilities iformation field"under Clause 9.4.2.313) to enable indication of 20 MHz onl non-AP STA capabilties. | RevisedDiscussion: in 5/6GHz band, the Supported Channel Width field can be used to indicate whether a non-AP STA is 20 MHz only STA. However in 2.4GHz band, the typical implementation is 20 MHz STA that can support more mandatory features than 20MHz-only STA for IoT market.There is a requirement to differentiate normal 20MHz STA and 20MHz only STA.  |
| 12161 | 228 |  | Need to define the capabilities of 20 MHz only non AP STA as it covers very important market of IoT. In the worst case (if not all are defined) there needs to be atleast one bit in EHT capabilities that distinguishes 20 MHz only non AP STA from non AP MLD. This is important in 2.4 GHz and helps AP to schedule appropriately. | There were 6 bits used for 20 MHz only non AP STA in 11ax and is used for various other capabilities such as 320 MHz and 4K QAM. We need to incorporate it there or i am open to other suggestions from the group. | RevisedDiscussion: in 5/6GHz band, the Supported Channel Width field can be used to indicate whether a non-AP STA is 20 MHz only STA. However in 2.4GHz band, the typical implementation is 20 MHz STA that can support more mandatory features than 20MHz-only STA for IoT market.There is a requirement to differentiate normal 20MHz STA and 20MHz only STA.  |

**9.4.2.313.3 EHT PHY Capabilities Information field**

***TGbe editor: Change Figure 9-1002af as follows(#13944. 13945, 12161)***

B0 B1 B2 B3 B4 B5 B6

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Reserved | Support For 320 MHzIn 6 GHz | Support For 242-tone RU In BW Wider Than 20 MHz | NDP With4 EHT-LTF And3.2 µs GI | Partial Bandwidth UL MU-MIMO | SU Beamformer | SU Beamformee |

Bits: 1 1 1 1 1 1 1 B7 B9 B10 B12 B13 B15 B16 B18 B19 B21 B22 B24 B25

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Number Of | Number Of | Number Of |  |
| Beamformee SS | Beamformee SS | Beamformee SS | Sounding | Sounding | Sounding | Ng = 16 SU |
| (≤ 80 MHz) | (= 160 MHz) | (= 320 MHz) | Dimensions (≤ 80 MHz) | Dimensions (= 160 MHz) | Dimensions (= 320 MHz) | Feedback |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bits 3 | 3 | 3 | 3 | 3 | 3 | 1 |
| B26 | B27 | B28 | B29 | B30 | B31 | B32 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ng = 16 MUFeedback | Codebook Size,  = 4, 2 SU Feedback | Codebook Size,  = 7, 5 MU Feedback | Triggered SU Beamforming Feedback | Triggered MU Beamforming Partial BW Feedback | Triggered CQI Feedback | Partial Bandwidth DL MU-MIMO |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bits: 1 | 1 | 1 |  | 1 |  | 1 | 1 | 1 |
| B33 | B34 | B35 | B36 |  | B39 | B40 | B41 | B42 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| EHT PSR-Based SR Support | Power Boost Factor Support | EHT MU PPDUWith4 EHT-LTF And0.8 µs GI | Max Nc | Non-Triggered CQI Feedback | Tx 1024-QAM And 4096-QAM< 242-tone RU Support | Rx 1024-QAM And 4096-QAM< 242-tone RU Support |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bits: 1 |  | 1 |  |  | 1 |  |  | 4 |  | 1 | 1 | 1 |
| B43 | B44 |  | B45 | B46 |  | B50 | B51 |  | B54 | B55 | B56 | B57 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| PPE Thresholds Present | Common Nominal Packet Padding | Maximum Number Of Supported EHT-LTFs | Support Of MCS 15 In MRU (#11140) | Support Of EHT DUP (MCS 14) In 6 GHz | Support For 20 MHzOperating STA Receiving NDP With Wider Bandwidth | Non-OFDMA UL MU-MIMO (BW ≤ 80 MHz) |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bits: 1 | 2 | 5 | 4 | 1 | 1 | 1 |
| B58 | B59 | B60 | B61 | B62 | B63 | B64 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Non-OFDMA UL MU-MIMO(BW = 160 MHz) | Non-OFDMA UL MU-MIMO(BW = 320 MHz) | MU Beamformer (BW ≤ 80 MHz) | MU Beamformer (BW = 160 MHz) | MU Beamformer (BW = 320 MHz) | TB Sounding Feedback Rate Limit | Rx 1024-QAM InWider Bandwidth DL OFDMASupport |

Bits 1 1 1 1 1 1 1

B65 B66 B67 B68 B69 B71

20 MHz-Only M-RU Support

20 MHz-Only Triggered MU Beamforming Full BW Feedback

20 MHz-Only Light Support

Rx 4096-QAM In

Wider Bandwidth DL OFDMA

Support

Reserved

Bits: 1 1 1 1 3

**Figure 9-1002af—EHT PHY Capabilities Information field format**

***TGbe editor: Change the following raws in Table 9-401k as follows((#13944. 13945, 12161)***

|  |  |  |
| --- | --- | --- |
| Non-OFDMA UL MU-MIMO(BW ≤ 80 MHz) | For an AP, indicates support for non-OFDMA UL MU-MIMO reception of an EHT TB PPDU, for PPDU bandwidths of 20, 40, and 80 MHz (UL MU-MIMO). | For an AP STA:Set to 0 if not supported. Set to 1 if supported.If the maximum number of spatial streams indicated for reception, for any MCS, in the EHT-MCS Map (BW ≤ 80 MHz, Excluding 20 MHz- Only Non-AP STAs) subfield within the Supported MCS and Nss Set field, (#12002)is greater than or equal to four, then set to 1.For a 20 MHz-Only non-AP EHT STA with 20 MHz-Only Light Support equal to 1:Set to 0 if not supported. Set to 1 if supported.Reserved for a non-AP STA that is not a 20 MHz-Only non-AP EHT STA with 20 MHz-Only Light Support equal to 1. |

|  |  |  |
| --- | --- | --- |
| SU Beamformee | Indicates support for operation as an SU beam- formee. | For an AP:Set to 0 if not supported. Set to 1 if supported.For a 20 MHz-Only non-AP EHT STA with 20 MHz-Only Light Support equal to 1:Set to 0 if not supported. Set to 1 if supported.Set to 1 for a non-AP STA that is not a 20 Mz-Only non-AP EHT STA with 20 MHz-Only Light Support equal to 1. |

***TGbe editor: Add the following raws at the end of Table 9-401k as follows((#13944. 13945, 12161)***

|  |  |  |
| --- | --- | --- |
| 20 MHz-Only Light Support | Indicates whether a 20MHz-only STA can announce the optional support of multiple RUs, DL/UL MU MIMO, SU/MU beamformee. | Set to 0 if a 20 MHz-only EHT STA can announce the optional support of of multiple RUs, DL/UL MU MIMO, SU/MU beamformee.Set to 1 otherwise for 20 MHz-only EHT non-AP STA.Reserved for an AP and a non-AP STA that is not a 20 MHz-only EHT non-AP STA. |
| 20 MHz-Only Triggered MU Beamforming Full BW Feedback  | Indicates whether or not a 20 MHz-only non-AP EHT STA with 20 MHz-Only Light Support equal to 1 supports triggered MU beamforming full BW feedback. | For 20 MHz-only EHT STA wth 20 MHz-Only Light Support equal to 1Set to 1 if supported.Set to 0 otherwise.OtherwiseReserved |
| 20MHz-Only M-RU Support | Indicates whether or not a 20 MHz-only non-AP EHT STA with 20 MHz-Only Light Support equal to 1 supports multiple RUs. | For 20 MHz-only EHT STA wth 20 MHz-Only Light Support equal to 1Set to 1 if supported.Set to 0 otherwise.OtherwiseReserved |

**35.15 EHT BSS operation**

**35.15.1 Basic EHT BSS operation**

***TGbe editor: Add the following paragraph at the end of 35.15.1 (#13944. 13945, 12161)***

A 20 MHz-only non-AP EHT STA with dot11EHT20MzOnlyLightImplemented equal to true shall set 20MHz-Only Light Support subfield in its EHT Operation element to 1 and set the various subfields in HT Capabilities if exists, VHT Capabilitites if exists, HE Capabilities, EHT Capabilitites elements as shown in Table 35-7 (Indication of supported channel widths by an EHT STA) per the maximum supported channel width being equal to 20 MHz. A 20 MHz-only non-AP EHT STA affiliated with a non-AP MLD that includes at least one >20MHz affiliated non-AP STA shall set 20MHz-Only Light Support subfield in its EHT Operation element to 0.

**35.7.2 EHT sounding protocol**

***TGbe editor: Change subclause 35.7.2 as follows (#13944. 13945, 12161)***

……

An SU beamformee is an EHT STA that sets the SU Beamformee subfield (#12687)to 1 in the EHT PHY Capabilities Information field in the EHT Capabilities element it transmits. A non-AP EHT STA that is not a 20 MHz-Omly non-AP EHT STA with 20 MHz-Only Light Support equal to 1 shall set the SU Beamformee subfield to 1. A 20 MHz-Only non-AP EHT STA with 20 MHz-Only Light Support equal to 1 may set the SU Beamformee subfield to 1. An EHT AP may set the SU Beamformee subfield to 1.

……

A non-AP EHT STA that is not a 20 MHz-Only non-AP EHT STA with 20 MHz-Only Light Support equal to 1 shall support operation as an MU beamformee. A 20 MHz non-AP EHT STA with 20 MHz-Only Light Support equal to 1 may support operation as a MU beamformee. An EHT AP does not support operation as an MU beamformee.

……

**36. Extremely high throughput (EHT) PHY specification**

**36.1 Introduction**

**36.1.1 Introduction to the EHT PHY**

***TGbe editor: Change subclause 36.1.1 as follows (#13944. 13945, 12161)***

……

An EHT STA shall support the following features with the exception that MRU support is not the mandatory requirement for a 20 MHz-only non-AP STA with 20 MHz-Only Light Support equal to 1:

* (#13113)Transmission and reception of an EHT SU transmission.
* BCC coding (transmit and receive). (#11630)BCC coding is only supported for EHT PPDUs where all of the following conditions are satisfied:
	+ The user is assigned an RU or MRU whose size is less than or equal to 242 tones.
	+ The number of spatial streams assigned to the user is less than or equal to 4.
	+ The user is assigned EHT-MCSs 0–9, 15.
* LDPC coding (transmit and receive) in all supported EHT PPDU types, RU and MRU sizes, and number of spatial streams if a STA satisfies any of the following conditions:
	+ (#12179)The STA declares support of transmission and reception in channel bandwidths greater than 20 MHz.
	+ The STA declares support for transmitting or receiving more than 4 spatial streams.
	+ The STA declares support for at least one of EHT-MCSs 10, 11, 12, (#12528)13, and 14 (trans- mit and receive).
* Single spatial stream EHT-MCSs 0 to 7 (transmit and receive) in all supported channel widths and RU and MRU sizes of EHT PPDU.
* Single spatial stream EHT-MCSs 8 and 9 (transmit and receive) in all supported channel widths and RU and MRU sizes of EHT PPDU if the STA is not a 20 MHz-only non-AP STA.
* EHT-MCS 15 (transmit and receive) for
	+ 26-, 52-, 106-, and 242-tone RU for 20 MHz-only non-AP STA
	+ 26-, 52-, 106-, 242-, 484-, and 996-tone RU if the STA declares support for larger than (#12529)or equal to 80 MHz PPDU
	+ 2996-tone RU if the STA declares support for larger than or equal to 160 MHz PPDU
	+ 4996-tone RU if the STA declares support for 320 MHz PPDU
* Reception of the EHT-SIG field in an EHT MU PPDU at EHT-MCS 0, 1, 3, and 15.
* (#12134)(#13113)EHT SU transmission with a 2 EHT-LTF and 0.8 µs GI duration on the EHT- LTF and Data field OFDM symbols (transmit and receive).
* (#12134)(#13113)EHT SU transmission with a 2 EHT-LTF and 1.6 µs GI duration on the EHT- LTF and Data field OFDM symbols (transmit and receive).
* (#12134)(#13113)EHT SU transmission with a 4 EHT-LTF and 3.2 µs GI duration on the EHT- LTF and Data field OFDM symbols (transmit and receive).
* (#12135)40 MHz and 80 MHz channel widths and all RU and MRU sizes and locations applicable to the 40 MHz and 80 MHz channel widths in the 5 GHz and 6 GHz bands (transmit and receive) if the STA is not a 20 MHz-only non-AP STA.
* 20 MHz channel width and all RU and MRU sizes and locations applicable to the 20 MHz channel width in the 2.4 GHz, 5 GHz, and 6 GHz bands (transmit and receive).
* Transmission and reception of a non-OFDMA EHT MU PPDU with any preamble puncturing pattern listed in [Table 36-30 (Definition of the Punctured Channel Information field in the U-SIG for](#bookmark105) [an EHT MU PPDU using non-OFDMA transmissions)](#bookmark105) for the PPDU bandwidth supported by the STA.

……

A non-AP EHT STA shall support the following features with the exception that a 20 MHz-only EHT non-AP STA with 20 MHz-Only Light Support equal to 1 optionally supports MRUs, DL MU-MIMO, UL MU-MIMO:

* Reception of an EHT MU PPDU where (#11331)there are multiple RUs or MRUs and the RU or MRU allocated to the non-AP STA is not utilizing MU-MIMO (DL OFDMA).
* Transmission of an EHT TB PPDU where (#11331)there are multiple RUs or MRUs and the RU or MRU allocated to the non-AP STA is not utilizing MU-MIMO (UL OFDMA).
* Reception of a non-OFDMA EHT MU PPDU utilizing MU-MIMO (DL MU-MIMO) in the supported bandwidth. The maximum number of spatial streams per user the non-AP STA can receive in the DL MU-MIMO transmission shall be equal to min(*n*, 4), where *n* is the maximum number of spatial streams supported for reception of a non-OFDMA EHT MU PPDU sent to single non-AP STA. The non-AP STA shall be able to receive its intended spatial streams in a DL MU-MIMO transmission with a total number of spatial streams across all users of at least four.
* MU-MIMO transmission in a non-OFDMA EHT TB PPDU (UL MU-MIMO). The non-AP EHT STA shall support transmitting UL MU-MIMO where the total spatial streams summed across all users is less than or equal to eight.
* Responding with requested beamforming feedback in an EHT sounding procedure with at least four spatial streams in the EHT sounding NDP.
* Reception of 160 MHz EHT sounding NDP in the 5 GHz and 6 GHz bands if the non-AP EHT STA’s operating channel width is 80 MHz.
* Reception of 320 MHz EHT sounding NDP in the 6 GHz band if the non-AP EHT STA’s operating channel width is 80 MHz or 160 MHz.
* (#12135)Reception of a 160 MHz EHT MU PPDU, or transmission of a 160 MHz EHT TB PPDU in the 5 GHz and 6 GHz bands where the assigned RU or MRU is in the primary 80 MHz channel if the non-AP EHT STA is operating with 80 MHz channel width.
* Reception of a 320 MHz EHT MU PPDU, or transmission of a 320 MHz EHT TB PPDU in the 6 GHz band where the assigned RU or MRU is in the primary 80 MHz channel if the non-AP EHT STA is operating with 80 MHz channel width.
* Reception of a 320 MHz EHT MU PPDU, or transmission of a 320 MHz EHT TB PPDU in the 6 GHz band where the assigned RU or MRU is in the primary 160 MHz channel if the non-AP EHT STA is operating with 160 MHz channel width.
* Reception of an EHT MU PPDU to multiple users with a 2 EHT-LTF and 0.8 µs GI duration on the EHT-LTF and Data field OFDM symbols.
* Reception of an EHT MU PPDU to multiple users with a 2 EHT-LTF and 1.6 µs GI duration on the EHT-LTF and Data field OFDM symbols.
* Reception of an EHT MU PPDU to multiple users with a 4 EHT-LTF and 3.2 µs GI duration on the EHT-LTF and Data field OFDM symbols.
* Transmission of an EHT TB PPDU utilizing non-OFDMA UL MU-MIMO with a 1 EHT-LTF and

1.6 µs GI duration on the EHT-LTF and Data field OFDM symbols.

* Transmission of an EHT TB PPDU with a 2 EHT-LTF and 1.6 µs GI duration on the EHT-LTF and Data field OFDM symbols.
* Transmission of an EHT TB PPDU with a 4 EHT-LTF and 3.2 µs GI duration on the EHT-LTF and Data field OFDM symbols.
* Full bandwidth sounding as defined in 35.7.2 (EHT sounding protocol).
* Reception of an OFDMA EHT MU PPDU with any preamble puncturing pattern as specified in [36.3.12.11.2 (Preamble puncturing for EHT MU PPDUs in an OFDMA transmission)](#bookmark173).

……

A 20 MHz operating non-AP EHT STA shall support the following with the exception that a 20 MHz-only EHT non-AP STA with 20 MHz-Only Light Support equal to 1 optionally supports MRUs:

* 26-, 52-, and 106-tone RU sizes and 52+26-tone MRU size on locations allowed in [36.3.2.6 (RU and](#bookmark47) [MRU restrictions for 20 MHz operation)](#bookmark47) in the primary 20 MHz channel within 40 MHz PPDU in the 2.4 GHz band, and 40 MHz, 80 MHz, and 160 MHz PPDU in the 5 GHz and 6 GHz bands, and 320 MHz PPDU in the 6 GHz band.

……

***TGbe editor: Add the following paragraph at the end of subclause 36.1.1 (#13944. 13945, 12161)***

a 20 MHz-only EHT non-AP STA with 20 MHz-Only Light Support equal to 0 may support the following:

* 52+26-tone MRU size on locations allowed in [36.3.2.6 (RU and](#bookmark47) [MRU restrictions for 20 MHz operation)](#bookmark47)
* Reception of a non-OFDMA EHT MU PPDU utilizing MU-MIMO (DL MU-MIMO)
* MU-MIMO transmission in a non-OFDMA EHT TB PPDU (UL MU-MIMO). The non-AP EHT STA shall support transmitting UL MU-MIMO where the total spatial streams summed across all users is less than or equal to eight. The maximum number of spatial streams per user the non-AP STA can receive in the DL MU-MIMO transmission shall be equal to min(*n*, 4), where *n* is the maximum number of spatial streams supported for reception of a non-OFDMA EHT MU PPDU sent to single non-AP STA. The non-AP STA shall be able to receive its intended spatial streams in a DL MU-MIMO transmission with a total number of spatial streams across all users of at least four,
* Triggered MU beamforming full BW feedback.

**C.3 MIB Detail**

***TGbe editor: Add the following row at the end of Dot11PhyEHTEntry sequence: (#13944. 13945, 12161)***

dot11EHT20MzOnlyLightImplemented TruthValue,

***TGbe editor: Add the following MIB variable definition as the last one in dot11 Phy EHT TABLE: (#13944. 13945, 12161)***

dot11EHT20MzOnlyLightImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the STA is capable of 20MHz bandwidth and announcing whether it implements multiple RUs, DL/UL MU-MIMO, beamformee, Triggered MU beamforming full BW feedback.

This capability is disabled otherwise."

DEFVAL { false }

::= { dot11PhyEHTEntry x }