IEEE P802.11
Wireless LANs

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| LB266 CR for 36.1.1 Introduction to the EHT PHY |
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Abstract

This submission contains proposed comment resolutions to comments on P802.11be D2.0.

The changes are based on P802.11be D2.0.

This submission provides a resolution to the following CIDs:

* 11214, 11235, 11281, 11329, 11629, 12195, 12296, 12572, 11327, 11328

Revisions:

* Rev 0: Initial version of the document.

## CID 11214

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 543.20 | 36.1.1 | text: 320 MHz channel width RU and MRU size larger than 996 tones in the 6 GHz band (transmit andreceive). expected the size is larger than 2x996 tones. | replace 996 by 2x996 | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r1** |

**Discussion:**

1. One thing to clarify is that in 6 GHz band, for a STA (regardless of an AP or a non-AP STA), the optional bandwidth is 320 MHz channel width RU and MRU size larger than 2×996 tones instead of 996 tones. The reason is that for an AP, in 6 GHz, the 160MHz bandwidth is mandatory. The detailed analysis is summarized as follows. The description in the current spec isn’t correct.

Agreement 1:

802.11be AP is mandatory to support the following:

* 160 MHz operating channel width in 6 GHz band
* 80 MHz operating channel width in 5 GHz band
* 20 MHz operating channel width in 2.4 GHz band

NOTE – “soft AP” is TBD.

[Motion 124, #SP178, [1] and [2]]

Agreement 2:

It is mandatory for a non-AP STA to support 80 MHz operating channel width in 5 and 6 GHz bands.

* Except for 20 MHz only client (if defined in EHT).

[Motion 124, #SP179, [1] and [2]]

Agreement 3:

802.11be supports that 80 MHz and 160 MHz operating STA shall be able to participate in a higher BW DL and UL OFDMA transmission.

* STA shall be able to decode the preamble and its assigned RU (some restrictions TBD).
* No capability bit as in 802.11ax.

[Motion 115, #SP75, [16] and [25]]

* According to agreement 3, 80 MHz and 160 MHz operating STA, regardless of an AP or a non-AP STA, is mandatory to support higher bandwidth OFDMA transmission.
* According to agreement 1, it can be seen that for an 802.11be AP, 160 MHz operating channel width in 6 GHz band is mandatory, which means RU and MRU size smaller than or equal to 2×996 tones in the 6 GHz band is mandatory. In other words, RU and MRU size larger than 2×996 tones in the 6 GHz band is optional.
* According to agreement 2, it can be seen that for an EHT non-AP STA, 80 MHz operating channel width in 6 GHz band is mandatory, which means RU and MRU size smaller than or equal to 996 tones in the 6 GHz band is mandatory. In other words, RU and MRU size larger than 996 tones in the 6 GHz band is optional.
* Thus, for an EHT STA regardless of an AP or a non-AP STA, RU and MRU size larger than 2×996 tones in the 6 GHz band is optional.

An EHT STA may support the following features:

— EHT-MCSs 10 to 13 (transmit and receive) if the STA is not a 20 MHz-only non-AP STA. EHT-MCSs 8 to 13 (transmit and receive) if the STA is a 20 MHz-only non-AP STA.

— EHT-MCS 14 (transmit and receive) in the 6 GHz nonpunctured transmission for single user in 80 MHz, 160 MHz, and 320 MHz EHT MU PPDUs, if the STA declares support for 80 MHz, 160 MHz, and 320 MHz PPDU, respectively.

— Single spatial stream EHT-MCS 15 (transmit and receive) in 52+26-, 106+26-, 484+242-, 996+484-, 996+484+242-, and 3×996-tone MRUs.

NOTE—EHT-MCS 15 is not defined for 2×996+484- and 3×996+484-tone MRUs.
— Two or more spatial streams (transmit and receive).
— Single user transmission using EHT MU PPDU with a 4× EHT-LTF and 0.8 µs GI duration on the
EHT-LTF and Data field OFDM symbols (transmit and receive).
— 40 MHz channel width RU and MRU size larger than 242 tones in the 2.4 GHz band (transmit and
receive).
— 160 MHz channel width RU and MRU size larger than 996 tones in the 5 GHz band (transmit and
receive).
— 320 MHz channel width RU and MRU size larger than 2×996 tones in the 6 GHz band (transmit and
receive)

1. For better understanding, the description related to bandwidth feature in sub-clause 36.1.1 is summarized as follows.
* An EHT STA shall support the following features: (Line 50, Page 542 in TGbe Draft D2.0)

—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).

* An EHT STA may support the following features: (Line 14, Page 543 in TGbe Draft D2.0)

—40 MHz channel width RU and MRU size larger than 242 tones in the 2.4 GHz band (transmit and receive).

—160 MHz channel width RU and MRU size larger than 996 tones in the 5 GHz band (transmit and receive).

—320 MHz channel width RU and MRU size larger than 2×996 tones in the 6 GHz band (transmit and receive).

* An EHT AP shall support the following features: (Line 35, Page 543 in TGbe Draft D2.0)

—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 band (transmit and receive).—40 MHz, 80 MHz, and 160 MHz channel widths and all RU and MRU sizes and locations applicable to the 40 MHz, 80 MHz, and 160 MHz channel widths in the 6 GHz bands (transmit and receive).

* A non-AP EHT STA shall support the following features: (Line 47, Page 544 in TGbe Draft D2.0)

—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 band (transmit and receive) except for 20 MHz-only non-AP EHT STA.

* A non-AP EHT STA may support the following: (Line 21, Page 545 in TGbe Draft D2.0)

—160 MHz channel width and RU and MRU size larger than 996 tones in the 6 GHz band (transmit and receive).

From the text with the same color, we have the following conclusion:

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|  | Mandatory | Optional |
| 2.4G | 20M (AP & non-AP STA) | 20M<BW<40M (AP & non-AP STA) |
| 5G | 20M (AP & non-AP STA)40M (AP), 80M (AP)40M (non-AP STA), 80M (non-AP STA) | 80M<BW<160M (AP & non-AP STA) |
| 6G | 20M (AP & non-AP STA)40M (AP), 80M (AP), 160M (AP)40M (non-AP STA), 80M (non-AP STA) | 160M<BW<320M (AP & non-AP STA)80M<BW<160M (non-AP STA) |

1. For more clear illustration, it is better to reorganize the features related to the bandwidth in terms of the frequency band 2.4G/5G/6G.

**Instructions to the Editor:**

Please make the following changes in Line 50, Page 542in TGbe Draft D2.0:

An EHT STA shall support the following features:

—20 MHz channel width and all RU and MRU sizes and locations applicable to the 20 MHz channel width in the 2.4 GHz band (transmit and receive).

—20 MHz, 40 MHz and 80 MHz channel widths and all RU and MRU sizes and locations applicable to the 20MHz, 40 MHz and 80 MHz channel widths in the 5 GHz band (transmit and receive).

Please make the following changes in Line 14, Page 543in TGbe Draft D2.0:

An EHT STA may support the following features:

—40 MHz channel width RU and MRU size larger than 242 tones in the 2.4 GHz band (transmit and receive).

—160 MHz channel width RU and MRU size larger than 996 tones in the 5 GHz band (transmit and receive).

Please make the following changes in Line 35, Page 543in TGbe Draft D2.0:

An EHT AP shall support the following features:

—20MHz, 40 MHz, 80 MHz, and 160 MHz channel widths and all RU and MRU sizes and locations applicable to the 20MHz, 40 MHz, 80 MHz, and 160 MHz channel widths in the 6 GHz bands (transmit and receive).

Please make the following changes in Line 19, Page 544in TGbe Draft D2.0:

An EHT AP may support the following features:

—320 MHz channel width RU and MRU size larger than 2×996 tones in the 6 GHz band (transmit and
receive)

Please make the following changes in Line 47, Page 544in TGbe Draft D2.0:

A non-AP EHT STA shall support the following features:

—20MHz, 40 MHz and 80 MHz channel widths and all RU and MRU sizes and locations applicable to the 20MHz, 40 MHz and 80 MHz channel widths in the 6 GHz band (transmit and receive) except for 20 MHz-only non-AP EHT STA.

Please make the following changes in Line 21, Page 545in TGbe Draft D2.0:

A non-AP EHT STA may support the following:

—320MHz channel width and RU and MRU size larger than 996 tones in the 6 GHz band (transmit and receive)

## CID 11235

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.45 | 36.1.1 | "The EHT PHY defines RUs comprising of 26, 52, 106, 242, 484, 996, 2ï´996 or 4ï´996 tones in 36.3.2.1 (Subcarriers and resource allocation in EHT PPDUs), and MRUs comprising two or more RUs in certain combinations in 36.3.2.2 (Subcarriers and resource allocation for multiple RUs).The EHT PHY provides support of multiple resource unit (MRU) assigned to a single STA. The EHT PHY also supports preamble puncturing of EHT MU PPDU." The ordering of these two paragraphs is awkward | Reorder the sentences to the following:"The EHT PHY defines RUs comprising of 26, 52, 106, 242, 484, 996, 2ï´996 or 4ï´996 tones in36.3.2.1 (Subcarriers and resource allocation in EHT PPDUs). The EHT PHY provides support of multiple resource unit (MRU) assigned to a single STA, and defines MRUs comprising two or more RUs in certain combinations in 36.3.2.2 (Subcarriers and resource allocation for multiple RUs).The EHT PHY supports preamble puncturing of EHT MU PPDU." | Rejected.After discussion, the original text is more clear. |

## CID 11281

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.50 | 36.1.1 | "The EHT PHY also supports preamble puncturing of EHT MU PPDU.". HE already supports preamble puncturing for OFDMA. Make clear that EHT defines preamble puncturing for both OFDMA and non-OFDMA. | See comment | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r1 under CID 12572.**Note that the resolutions for CID 11281, CID 11329, CID 11629, CID 12195, CID 12296, and CID 12572 are the same. |

## CID 11329

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.50 | 36.1.1 | Move the definition of "multiple resource unit (MRU)" to the 1st place MRU is mentioned, i.e, 2 lines above | as in the comment | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r1 under CID 12572.**Note that the resolutions for CID 11281, CID 11329, CID 11629, CID 12195, CID 12296, and CID 12572 are the same. |

## CID 11629

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.46 | 36.1.1 | Abbreviation MRU appears prior to be defined | Move next sentence (rows 50-51) before this one | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r0 under CID 12572.**Note that the resolutions for CID 11281, CID 11329, CID 11629, CID 12195, CID 12296, and CID 12572 are the same. |

## CID 12195

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.50 | 36.1.1 | The abbreviation MRU is defined in line #50, although it is already used, within this section, several lines above (line #46), and used throughout preceding chapters/sections and is already defined in the abbreviation list (Section 3). | Remove the definition of this abbreviation from this line or move it to line #46 (where MRU is mentioned for the first time in Section 36). | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r1 under CID 12572.**Note that the resolutions for CID 11281, CID 11329, CID 11629, CID 12195, CID 12296, and CID 12572 are the same. |

## CID 12296

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.50 | 36.1.1 | "multiple resource unit (MRU)" should be modified to "MRU". "multiple resource unit (MRU)" is also at P577 L40. | As in comment. | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r1 under CID 12572.**Note that the resolutions for CID 11281, CID 11329, CID 11629, CID 12195, CID 12296, and CID 12572 are the same. |

## CID 12572

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.50 | 36.1.1 | The 'resource unit' in 'multiple resource nit' here should be in plural form | Change it to 'multiple resource units' | RevisedAgreed in principle. Reflect the detailed explanation.**Instructions to the editor:****Please make the changes as shown in 11/22-1479r1 under CID 12572.**Note that the resolutions for CID 11281, CID 11329, CID 11629, CID 12195, CID 12296, and CID 12572 are the same. |

**Instructions to the Editor:**

Please make the following changes in Line 45, Page 541in TGbe Draft D2.0:

The EHT PHY defines RUs comprising of 26, 52, 106, 242, 484, 996, 2×996 or 4×996 tones in 36.3.2.1 (Subcarriers and resource allocation in EHT PPDUs), and MRUs comprising two or more RUs in certain combinations in 36.3.2.2 (Subcarriers and resource allocation for multiple RUs).

The EHT PHY provides support of MRU assigned to a single STA. The EHT PHY also supports preamble puncturing of EHT MU PPDU for both OFDMA and non-OFDMA.

Please make the following changes in Line 40, Page 577in TGbe Draft D2.0:

The EHT PHY supports the usage of MRU in an EHT PPDU. An MRU consists of selected combinations of multiple RUs of 26-tone RU, 52-tone RU, 106-tone RU, 242-tone RU, 484- tone RU, 996-tone RU, and 2×996-tone RU. The tone indices of the various RUs for different EHT PPDU bandwidths are defined in 36.3.2.1 (Subcarriers and resource allocation in EHT PPDUs).

## CID 11327

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.22 | 36.1.1 | "which is based on the OFDM PHY defined in Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification)". Clause 16 doesn't define OFDM PHY. Should be Clause 17 | as in the comment | Revised**Instructions to the editor:**Change ‘Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification)’ to ‘Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification)’. |

**Background:**



## CID 11328

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| Page.Line | Clause Number | Comment | Proposed Change | Resolution |
| 541.43 | 36.1.1 | Change "with the total across all users not exceeding eight spatial streams" to " with the total spatial streams across all users not exceeding eight." | as in the comment | Revised**Instructions to the editor:**Change ‘with the total across all users not exceeding eight spatial streams’ to ‘with the total number of spatial streams across all users not exceeding eight.’ |

**Background:**

