IEEE P802.11  
Wireless LANs

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| Comment Resolutions for Clause 36.3.10 Mathematical description of signals | | | | |
| Date: 2021-02-10 | | | | |
| Author(s): | | | | |
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Abstract: This document contains proposed resolutions for comments in *Clauses 36.3.10* from 11be D0.3 with 20 CIDs below.

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| ***Clause 36.3.10***   * 1259, 1330, 1331, 1332, 1335, 1336, 1337, 1339, 1340, 1341, 1559, 1560, 1968, 2611, 2612, 2613, 2615, 3044, 3170, 3171 | | | |  | | |
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| 1259 | 36.3.10.3 | | 218.01 | Need to provide the meaning of n\_p20 |  | | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx). | | |

be editor: please make the changes in D0.3 *Clause 36.3.10.3*

* On P218L01 (CID #1259):

is an integer indicating the primary 20MHz channel location corresponding to dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelbandwidth values, with possible range .

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| 1330 | 36.3.10.2 | 216.41 | Inefficient language; "For a 20 MHz non-OFDMA EHT PPDU transmission, the 20 MHz is divided into 256 subcarriers. ... For a 20 MHz OFDMA EHT PPDU transmission, the 20 MHz is divided into 256 subcarriers." Also, this applies to the EHT-modulated portion only | Merge into "For a 20 MHz EHT PPDU transmission, the 20 MHz is divided into 256 subcarriers. The EHT-modulated portion of a 20 MHz EHT OFDMA transmission is transmitted on all or a subset of the subcarriers -122 to -2 and 2 to 122, with 0 being the center subcarrier. The EHT-modulated portion of a 20 MHz EHT non-OFDMA transmission is transmitted on all or a subset of the subcarriers -122 to -4 and 4 to 122, with 0 being the center subcarrier. Ditto for 40M, 80M paragraphs. For the 160 and 320M paragraphs, narrow the description to the "EHT modulated portion" in each case. | **Revised.**  Agree with the commentor that 4x numerology tone plan only applies to EHT-modulated fields in an EHT PPDU.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |
| 2611 | 36.3.10.2 | 216.56 | For 80M non-OFDMA transmission, only a subset of subcarriers may be used if the transmission is punctured | Edit as follows:  For an 80 MHz non-OFDMA EHT PPDU transmission, the 80 MHz is divided into 1024 subcarriers. The signal is transmitted on all or a subset of subcarriers -500 to -3 and 3 to 500, with 0 being the center subcarrier. | **Revised.**  Agree with the commentor that 80MHz non-OFDMA transmission could be punctured. For 80MHz punctured non-OFDMA transmission , the tone plan is the same as 80MHz OFDMA transmission, which is a subset of subcarriers -500 to -12 and 12 to 500.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the changes in D0.3 *Clause 36.3.10.2*

* On P216L41 (CID #1330, CID #2611):

For a 20 MHz EHT PPDU transmission, the 20 MHz is divided into 256 subcarriers for the EHT-modulated fields. For a 20 MHz non OFDMA EHT PPDU transmission, the signal of each EHT-modulated field is transmitted on subcarriers -122 to -2 and 2 to 122, with 0 being the center subcarrier. For a 20 MHz OFDMA EHT PPDU transmission, the signal of each EHT-modulated field is transmitted on all or a subset of the subcarriers -122 to -4 and 4 to 122, with 0 being the center subcarrier.

For a 40 MHz EHT PPDU transmission, the 40 MHz is divided into 512 subcarriers for the EHT-modulated fields. For a 40 MHz non OFDMA EHT PPDU transmission, the signal of each EHT-modulated field is transmitted on subcarriers -244 to -3 and 3 to 244, with 0 being the center subcarrier. For a 40 MHz OFDMA EHT PPDU transmission, the signal of each EHT-modulated field is transmitted on all or a subset of subcarriers -244 to -3 and 3 to 244, with 0 being the center subcarrier.

For an 80 MHz EHT PPDU transmission, the 80 MHz is divided into 1024 subcarriers for the EHT-modulated fields. For an 80MHz nonpunctured non-OFDMA EHT PPDU, the signal of each EHT-modulated field is transmitted on subcarriers -500 to -3 and 3 to 500, with 0 being the center subcarrier. For an 80 MHz OFDMA EHT PPDU or punctured non-OFDMA EHT PPDU transmission, the signal of each EHT-modulated field is transmitted on all or a subset of the subcarriers -500 to -259, -253 to -12, 12 to 253, and 259 to 500, with 0 being the center subcarrier.

For a 160 MHz EHT PPDU transmission, each half 80 MHz bandwidth is divided into 1024 subcarriers for the EHT-modulated fields, and the subcarriers on which the signal is transmitted in each 80 MHz bandwidth is identical to an 80 MHz EHT PPDU transmission, depending on whether it is nonpunctured non-OFDMA, punctured non-OFDMA or OFDMA transmission within the corresponding 80 MHz.

For a 320 MHz EHT PPDU transmission, each half 160 MHz bandwidth is divided into 2048 subcarriers for the EHT-modulated fields, and the subcarriers on which the signal is transmitted in each 160 MHz bandwidth is identical to an 160 MHz EHT PPDU transmission, depending on whether it is nonpunctured non-OFDMA, punctured non-OFDMA or OFDMA transmission within the corresponding 160 MHz.

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| 1331 | 36.3.10.3 | 217.24 | "dot11CurrentStartingFactor" is not defined in the 11be, 11ax or 11md drafts | Change to "dot11ChannelStartingFactor"  . | **Accepted.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the changes in D0.3 *Clause 36.3.10.3*

* On P217L24 (CID #1331):

(36-3)

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| 1332 | 36.3.10.4 | 219.48 | "NSYM is is the number of data OFDM symbols." is sloppy | Change to "NSYM is the number of OFDM symbols in the Data field" | **Accepted.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P219L48 (CID #1332):

and is the number of OFDM symbols in the Data field.

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| 1335 | 36.3.10.4 | 221.48 | "in the allocated 20 MHz channels" is vague | Provide a cross-reference to where this allocaiotn process / control knob is defined. | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P221L48 (CID #1335):

For pre-EHT modulated fields, is the set of subcarriers indices for all the tones in the corresponding 20 MHz channels where the EHT-modulated fields are located for the *r*-th occupied RU or MRU.

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| 1336 | 36.3.10.4 | 221.30 | "T Subfield" in "w(T Subfield)" is undefined | Add a reference for Tsubfield to Table 36-9. | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P221L30 (CID #8996):

is a windowing function. An example function, , is given in 17.3.2.5 (Mathematical conventions in the signal descriptions). is for L-STF, for L-LTF, for L-SIG, for RL-SIG, for U-SIG, for EHT-SIG, for EHT-STF of EHT MU PPDU, for EHT-STF of EHT TB PPDU, for EHT-LTF, or for EHT-Data.

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| 1337 | 36.3.10.4 | 221.48 | (36-10) has "K" but only "Kr" is described underneath | Change K to Kr in (36-10)? | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P221L48 (CID #1337): Please change *K* to *Kr*, and change to in Equation (36-10)

(36-10)

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| 1339 | 36.3.10.4 | 223.25 | AFAIK, the number of tones in a 1x/2x EHT-LTF is not exactly |Kr|/4 or |Kr|/2. So actually P223L30 is the \*definition\* of |Kr^EHT-LTF| and that \*definition\* is not a cardinality, so it is misleading to use |.| here. | Replace |Kr^EHT-LTF| by some other term such SACKr^EHT-LTF ("Simplified and Approximate Cardinality of ...") | **Revised.**  In the text, is not defined as the Cardinality of the set of modulated subcarriers in EHT-LTF field, unlike and , which are defined as the Cardinality of the set of modulated subcarriers in EHT-STF and Data fields. Instead it is defined as a function of , the cardinality of the set of subcarriers . To eliminate any confusions of using , replace with .  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |
| 1340 | 36.3.10.4 | 223.24 | "Kr^Field is the cardinality of the set of modulated subcarriers within for the EHT-STF and Data fields." does not a) define "Kr^Field" in terms of "Field", b) mention "r" | Try "Kr^Field is the cardinality of the set of modulated subcarriers within the r-th RU of Field. Kr^Field is used for the EHT-STF and Data fields." | **Revised.**  Same resolution as CID #1339.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |
| 1341 | 36.3.10.4 | 222.4 | Missing or ill-connected explanation of "Field" parameter in the definition of "Betar\_Field" at P222L4 and P222L15, definition of NField^Tone at P222L5, P222L34, epsilonField at P2223L18, DeltaF,Field at P223L55, TGI,Field, at P224L4, | E.g. "betar^Field is the power normalization of field Field and is defined in", "betar^Field = xxx when Field is a pre-EHT-modulated field" etc, Nfield^Tone ... as function of Field and Tone" etc etc etc. Apply this rigor to the definition of all parameters of all quantities in all equations. | **Revised.**  More texts are added to clarify Field for better understanding.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

On P220L40 (CID #1339, CID #1340, CID #1341): Please add the following sentence before the paragraph above Equation (36-9).

In the remainder of this subclause, Field is used as a generic name to represent one of the valid EHT PPDU fields in all the mathematical symbols with Field as subscript or superscript.

In an EHT MU PPDU, … in Equation (36-9)

is the power normalization factor of the corresponding field in the *r*-th occupied RU or MRU and is defined in Equation (36-11).

Please replace with in Equation (36-11)

(36-11)

is the number of tones in the corresponding field. Table 36-17 (Number of modulated subcarriers and guard interval duration values for EHT PPDU fields) summarizes the various values of as a function of bandwidth.

is the power deboosting factor of the corresponding pre-EHT modulated field relative to L-SIG field defined as

equals the number of modulated subcarriers within (See Table 36-14⎯Frequently used parameters) for the EHT-STF and Data fields. For the EHT-LTF field, is defined as below to ensure per tone power are the same for both EHT-LTF and Data fields, regardless of 1x, 2x or 4x EHT-LTF

is the subcarrier frequency spacing of the corresponding field. For pre-EHT modulated fields, given in Table 36-9 (Timing-related constants). For EHT modulated fields, given in Table 36-9 (Timing-related constants).

is the guard interval duration used for each OFDM symbol in the corresponding field. The value of guard interval duration for each EHT PPDU field is defined in Table 36-9 (Timing-related constants).

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| 1559 | 36.3.10.4 | 223.4 | the BW field in the U-SIG field only includes the value for the indication of 20/40/80/160/320MHz. So, delete the EHT-CBW-PUNC80,EHT-CBW-PUNC160,EHT-CBW-PUNC320 | As in comment | **Revised.**  Agree with commentor that punctured information is separated from bandwidth information in USIG for EHT PPDU, hence CH\_BANDWIDTH only need to convey bandwidth values.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |
| 1560 | 36.3.10.4 | 224.52 | the BW field in the U-SIG field only includes the value for the indication of 20/40/80/160/320MHz. since u-SIG does not include the BW puncture and the same phase rotation is applied to pre-EHT modulated field regardless of puncturing, it seems that the punctured BW does not need. delete the EHT-CBW-PUNC80,EHT-CBW-PUNC160,EHT-CBW-PUNC320 in table 36-18. | As in comment | **Revised.**  Agree with commentor that punctured information is separated from bandwidth information in USIG for EHT PPDU, hence CH\_BANDWIDTH only need to convey bandwidth values.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |
| 3171 | 36.3.10.4 | 224.52 | Per 11-21/0157, there are no EHT-CBW-PUNC80/160/320 in CH\_BANDWIDTH. | In Table 36-18, delete rows for EHT-CBW-PUNC80/160/320. | **Revised.**  Agree with commentor that punctured information is separated from bandwidth information in USIG for EHT PPDU, hence CH\_BANDWIDTH only need to convey bandwidth values.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P223L4(CID #1559):

* On P224L52(CID #1560, CID #3171):

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| Table 36-18— CH\_BANDWIDTH and for pre-EHT modulated fields | |
| CH\_BANDWIDTH |  |
| CBW20 | *k,*20 |
| CBW40 | *k,*40 |
| CBW80 | *k,*80 |
| CBW160 | *k,*160 |
| CBW320 | *k,*320 |
| - | - |
| - | - |
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| 1968 | 36.3.10.4 | 219.51 | Figure 36-32, the "Non-EHT portion" should include RL-SIG and "EHT portion" should starts from U-SIG. | Change the duration of "Non-EHT portion" and "EHT Portion". | **Revised.**  Agree with the commentor that RL-SIG exists in HE PPDU as well, and should be in non-EHT portion.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P219L51(CID #1968): Please replace Figure 36-32 with figure below.



Figure 36-32 – Timing Boundaries for EHT PPDU fields

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| 2612 | 36.3.10.3 | 217.41 | Maximum valid channel number for 6G is 233 (according to P802.11ax D8.0 Section 27.3.23.2) and not 253 as specified. | Table 36-15, edit rows corresponding to dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentPrimaryChannel as follows:  Valid range is 1 to 200 for 5 GHz band, and 1 to 233 253 for 6 GHz band. | **Revised.**  Agree with commentor the number of valid channels in 6GHz band is 233 same as in 11ax spec.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.3*:

* On P217L41(CID #2612): Please replace 253 with 233 for 6 GHz band in Table 36-15.

**Table 36-15—Fields to specify EHT channels**

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|  | For a 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 320 MHz channel, denotes the channel center frequency. Valid range is 1 to 200 for 5GHz band, and 1 to 233 for 6GHz band. |
|  | Denotes the location of the primary 20 MHz channel.  Valid range is 1 to 200 for 5GHz band, and 1 to 233 for 6GHz band. |

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| 2613 | 36.3.10.4 | 219 | ER preamble not considered when defining timing boundaries and mathematical description of signals, though ER preamble itself is defined (e.g., in 36.3.11.7 (U-SIG)) | Need separate definitions for PPDUs with ER preamble, clarifying that this is for future versions: describe timing of U-SIG, and any power-scaling of legacy/non-legacy portions of the preamble. | **Rejected.**  In **36.3.11.7 U-SIG**, it is clearly states “For forward compatibility, EHT Release 1 defines an ER preamble while not defining an ER PPDU. This enables an EHT Release 1 STA to decode and interpret the version independent content in the U-SIG of an ER PPDU that may be introduced in future releases or amendments.”.  The commentor suggested to define PPDUs with ER preamble, which is not consistent with the text above.Since it is not clear ER PPDU will be introduced in future release or future amendment, including ER PPDU feature in the timing boundaries and mathematical descriptions of signals is immature. We can always update timing boundaries and mathematical description of signals once ER PPDU is defined in future release. |

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| 2615 | 36.3.10.4 | 223.34 | Description of eta\_pre-EHTin eq. (36-10) | In discussions with authors and those in favor of such scaling it was determined that thsi is useful for small RU transmissions, can non-unity value be limited to RU <= 242. | **Revised.**  Agree with commentor is intended for power scaling when f the RU assigned to the STA is a small RU, i.e, the size of the RU is less than or equal to 242.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |

be editor: please make the following changes in D0.3 *Clause 36.3.10.4*:

* On P217L41(CID #2612):

is the power scaling factor of a given field for an EHT TB PPDU. For the pre-EHT modulated fields, is in the range of when the size of the *r*-th occupied RU or MRU is less than or equal to 242 tones; otherwise . The same value applies to all pre-EHT modulated fields. For EHT modulated fields, .

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| 3044 | 36.3.10.3 | 217.18 | Since 11be only has 1 frequency segment, consider removing the "0" in CurrentChannelCenterFrequencyIndex0 | As commented | **Rejected.**  CurrentChannelCenterFrequencyIndex0 means the center frequency for the frequency segement 0, which does not conflict with the fact that there is only one frequency segment in 11be. Even in 11ac or 11ax, CurrentChannelCenterFrequencyIndex1 only has valid value for 80+80MHz channel, For other channel bandwidth values, e.g. 20MHz, 40MHz, 80MHz or 160MHz, there is only one frequency segment, and we still use CurrentChannelCenterFrequencyIndex0.  Another issue is that we need to add a new entry in Dot11EHTPHYEntry for CurrentChannelCenterFrequencyIndex if we remove 0 instead of set it in Dot11VHTPHYEntry which includes both CurrentChannelCenterFrequencyIndex0 and CurrentChannelCenterFrequencyIndex1. |

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| 3170 | 36.3.10.4 | 221.12 | Pre-EHT modulated fields and EHT modulated fields have been defined in P198L44. | Delete P221L12-15. | **Accepted.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-0323-01-00be-comment-resolutions-for-clause-36-3-10-mathematical-description-of-signals.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0323-00-00be-comment-resolution-for-mathematical-description-of-signals.docx). |