IEEE P802.11  
Wireless LANs

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| CC36 CR for Clause 36.3.10 Mathematical description of signals | | | | |
| Date: 2021-07-22 | | | | |
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Abstract: This document contains proposed resolutions for comments in *Clauses 36.3.11* from 11be D1.1 with 27 CIDs below.

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| ***Clause 36.3.11***  4551,4621,4625,4630,4665,4693,4844,4845,4846,4997  4998,4999,5000,5717,5816,5817,5818, 6807,6808,6809  6810,6811,7194,7195,7947,7994,8099 | | | |  | | |
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| 4551 | 36.3.11.3 | | 447.10 | Eq21-6 and 21-7 doesn't cover the relationship between f\_P20idx and fS20idx for 320MHz PPDU since clause 21 covers only up to 160MHz. Same issue for the L14-L22 in P397 | as in the comment | | **Rejected.**  Equation (21-6) indeed covers the relationship between and for 320MHz PPDU. Although in clause 21.3.7.3 Channel frequencies, the equation covers only up to 160MHz since 11ac only supports up to 160MHz PPDU. However, this equation also applies to 320MHz PPDU without any modification needed. Similarly, equations (21-7) to (21-10) can all be applied to 320MHz PPDU without any modification. Only the number of 20MHz channels for 320MHz PPDU is not defined in 21.3.7.3. But it is already defined in equation (36-4) in this paragraph before referencing to equations (21-6) to (21-7). It will be redundant to rewrite all those equations just for 320MHz PPDU. | | |

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| 4621 | 36.3.11.4 | 453.50 | The two examples choose values for phi1/2/3, but the reader is expected to manually reverse engineer what these are. | After (36-13) change "are given in Equation (36- 13) and Equation (36-14)." to "are given in Equation (36- 13), where phi1=1, phi2=-1, phi3 =-1, and in Equation (36-14) where phi1=1, phi2=1, phi3 =-1." | **Revised.**  Agree with the commentor that the suggested changes are easier to understand the examples.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the changes in D1.1 *Clause 36.3.11.4*

* On P453L50 (CID #4621):

Two examples of such 320 MHz phase rotations are given in Equation (36-13), where , , and , and Equation (36-14), where , , and .

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| 4625 | 36.3.11.3 | 446.37 | dot11CurrentChannelWidth here but a) dot11CurrentChannelWidth has no 320M value and b) dot11EhtCurrentChannelWidth at P331L12 (was that intended instead?) | Option a): extend dot11CurrentChannelWidth by adding 320M as a new allowed constant (see 11meD0P4194L63) except I'm not sure this is allowed (might break legacy - need to check); else option b) define the new EHT MIB variable dot11EhtCurrentChannelWidth in Annex C, and use it here. Also doubt check each usage of dot11CurrentChannelWidth and see if it needs to be dot11EhtCurrentChannelWidth instead. | **Revised.**  Agree with the commentor that it should be dot11EhtCurrentChannelWidth defined in Annex C MIB dot11PhyEHTEntry  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.3*:

* On P446L37 (CID #4625):

Replace all variables dot11CurrentChannelWidth with dot11EhtCurrentChannelWidth in subclause 36.3.11.3 Channel frequencies.

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| 4630 | 36.3.11.4 | 450.39 | P400L41-45 is probably correct but useless to the PHY since the PHY is not privy to the semantics of what is transmited in its PSDUs. If the PHY needs to know what is transmitted by the MAC, MAC needs to tell the PHY via an explicit parameter in PHYCONFIG\_VECTOR and/or a MIB variable | Define a (new) suitable PHYCONFIG\_VECTOR parameter and have the MAC configure it as information from recipient STAs change. Have the PHY use the new parameter. Keep this existing (layer-violating) language as an informative note. | Rejected.  The description is related to STA PHY capabilities field Power Boost Factor Support. It explained the the ratio between the maximum and minimum values of power boost factor which AP can apply in an EHT MU PPDU with more than one user, depending on Power Boost Factor Support field value. How to apply appropriate transmit power control to each RU to achieve the best possible performance at AP side is purely up to implementation. MAC does not have a mechanism to configure the correct values to apply to each RU, and pass them to PHY. The configuration of values can be done in PHY. |

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| 4665 | 36.3.11.3 | 225.50 | Not all parameters in this equation are defined immediately afterwards (N\_TX, gamma, w, T\_LSTF, Delta\_F,Pre-EHT) | To provide the defintions but avoid duplication, insert a catch-all at P226L25: "For all other parameters in (36-13), see (36-10) and the subsequent definition of the parameters therein." Ditto apply the equivalent of this after (36-16), (36-18), (36-19), (36-20) etc etc | **Rejected.**  The page, subclause and equations do not match the contents in D1.0. Equation (36-13) does not have the parameters commentor listed here. |

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| 4693 | 36.3.11.3 | 446.28 | dot11ChannelStartingFactor is not explained here | add some elabration to dot11ChannelStartingFactor | **Revised.**  Agree with the commentor.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.3*:

* On P446L28 (CID #4693):

where dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentPrimaryChannel are defined in Table 36-24 (Fields to specify EHT channels), and dot11ChannelStartingFactor is described in 17.3.8.4.2 (Channel numbering).

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| 4844 | 36.3.11.4 | 452.27 | The upper case gamma should be modified to the lower case k. | change upper case Gamma in with low case k as follows " | **Rejected.**  Lower case k is subcarrier index in equations (36-9) and (36-10). is used to calculate scaling factor as in (36-11), and clearly defined as the number of modulated subcarriers within *r*th RU for EHT modulated fields. |
| 4845 | 36.3.11.4 | 452.36 | The Equation is wrong. Change gamma with lower case k. | As in comment | **Rejected.**  Lower case k is subcarrier index in equations (36-9) and (36-10). is used to calculate scaling factor as in (36-11), and clearly defined as the number of modulated subcarriers within *r*th RU for EHT modulated fields. |

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| 4846 | 36.3.11.4 | 453.25 | In the reference title, the gamma term is missed. Add it. | modify the reference title as following  " Table 36-27 ((CH\_BANDWIDTH and for pre-EHT modulated fields)" | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.4*:

* On P453L25(CID #4846):

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Table 36-27 (CH\_BANDWIDTH and for pre-EHT modulated fields).

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| 4997 | 36.3.11.2 | 446.5 | Change "punctured OFDMA" to "punctured non-OFDMA". Ditto P396L11. | See the comment. | **Accepted.**  TGbe editor: Change "punctured OFDMA" to "punctured non-OFDMA" on P446L5, and P446L11. |

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| 4998 | 36.3.11.3 | 446.52 | Equation (21-5) in 21.3.7.3 doesn't cover the 20 MHz case. When dot11CurrentChannelWidth is 20 MHz f\_P20,idx = f\_c,idx0. Correct the sentence. | See the comment | **Revised.**  Agree with commentor it is more direct by using equation f\_P20,idx = f\_c,idx0 when dot11EhtCurrentChannelWidth is 20MHz.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.3*:

* On P446L51(CID #4998):

When dot11EHTCurrentChannelWidth is 20 MHz, . When dot11EHTCurrentChannelWidth is 40 MHz, 80 MHz, or 160 MHz, the relationship between and is specified in Equation (21-5) in 21.3.7.3 (Channel frequencies).

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| 4999 | 36.3.11.3 | 447.10 | When dot11CurrentChannelWidth is 40 MHz the relationship between f\_P40,idx and f\_c,idx0 is not defined. Correct the sentence. | See the comment. | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |
| 5000 | 36.3.11.3 | 447.16 | When dot11CurrentChannelWidth is 80 MHz the relationship between f\_P80,idx and f\_c,idx0 is not defined. Correct the sentence. | See the comment | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.3*:

* On P447L10(CID #4999, CID #5000):

When dot11EHTCurrentChannelWidth is 40 MHz, 80 MHz, 160 MHz, or 320 MHz, the relationship between and is specified in Equation (21-6) in 21.3.7.3 (Channel frequencies).

When dot11EHTCurrentChannelWidth is 80 MHz, 160 MHz, or 320 MHz, the relationship between and is specified in Equation (21-7), and the relationship between and is specified in Equation (21-8) in 21.3.7.3 (Channel frequencies).

When dot11EHTCurrentChannelWidth is 160 MHz or 320 MHz, the relationship between and is specified in Equation (21-9), and the relationship between and is specified in Equation (21-10) in 21.3.7.3 (Channel frequencies).

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| 5717 | 36.3.11.4 | 454.32 | CH\_BANDWIDTH field in TXVECTOR defined CBW320-1 and CBW320-2 separately. CH\_BANDWIDTH\_IN\_NON\_HT defined a single CBW320. | Modified table entry to include both CBW320-1 and CBW320-2 or state somewhere that CBW320-1 and CBW320-2 are mentioned as CBW320 collectively throughout. | **Revised.**  Agree with commentor that CBW320-1 and CBW320-2 should be included in the table.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.4*:

* On P454L32(CID #5717):

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| Table 36-27— CH\_BANDWIDTH and for pre-EHT modulated fields | |
| CH\_BANDWIDTH |  |
| CBW20 | *k,*20 |
| CBW40 | *k,*40 |
| CBW80 | *k,*80 |
| CBW160 | *k,*160 |
| CBW320, CBW320-1, CBW320-2 | *k,*320 |

* On P452L7:
* On P448L39: Add CBW320-1, CBW320-2 in the last entry of Table 36-25.

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|  | **CH\_BANDWIDTH** |  |
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| 320 MHz | CBW320, CBW320-1, CBW320-2 |  |

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| 5816 | 36.3.11.2 | 445.40 | Subcarrier indice in use for a 20 MHz or 40 MHz EHT PPDU is the same as that for a 20 MHz or 40 MHz HE PPDU. As a result, the text related to subcarrier indice in use for a 20 MHz or 40 MHz EHT PPDU can be simplified. | replace the 2nd and 3rd paragraph of this subclause by the following text:  "A 20 MHz or 40 MHz EHT PPDU has the same subcarrier indices in use as a 20 MHz or 40 MHz HE PPDU." | **Rejected.**  Although the commentor is right that subcarrier indices in use is the same for 20MHz and 40MHz HE PPDU and EHT PPDU, the text in 11be spec is more accurate than that in 11ax spec. I think it is better keep the current text for the sake of completeness of the spec. |

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| 5818 | 36.3.11.4 | 451.12 | In (36-11), N\_L-STF^Tone should be changed to N\_Field^Tone. | as in the comment. | **Revised.**  Agree with commentor.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |
| 6811 | 36.3.11.4 | 451.12 | In equation (36-11), 'N\_{L-STF}^Tone' for pre-EHT modulated fields should be replaced by 'N\_{Field}^Tone' | As in the comment. | **Revised.**  Agree with commentor.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.1 *Clause 36.3.11.4*:

* On P451L12(CID #5818, CID #6811):

(36-11)

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| 6807 | 36.3.11.3 | 446.42 | Description of 2.4 GHz channel frequencies missing in Table 36-24. Add valid range in 2.4 GHz for dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentPrimaryChannel  (as specified for n\_ch in 19.3.15.2 (Channel allocation in the 2.4 GHz Band)). | As in the comment. | **Revised.**  Agree with commentor that descriptions of 2.4GHz channel allocations are missing.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |
| 7194 | 36.3.11.3 | 446.42 | Change "channel center frequency" to "channel center frequency index" | Change "channel center frequency" to "channel center frequency index" | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx) |
| 7195 | 36.3.11.3 | 446.45 | Change "channel center frequency" to "channel center frequency index" | Change "channel center frequency" to "channel center frequency index" | **Rejected.**  This line does not have text “channel center frequency.” |

be editor: please make the following changes in D1.1 *Clause 36.3.11.3*:

* On P446L32(CID #6807, CID #7194, CID #7195):

**Table 36-24—Fields to specify EHT channels**

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| **Field** | **Meaning** |
|  | Channel width. Possible values represent 20 MHz, 40 MHz, 80 MHz, 160 MHz, and 320 MHz channels. |
|  | For a 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 320 MHz channel, denotes the location of the channel center frequency. Valid range is 1 to 13 for 2.4GHz band. 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 13 for 2.4GHz band. Valid range is 1 to 200 for 5GHz band, and 1 to 233 for 6GHz band. |

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| 6808 | 36.3.11.4 | 448.58 | Typo in Fig 36-34 (Timing boundaries for EHT PPDU fields): t\_PE should be t\_EHT-PE | As in the comment. | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |
| 8099 | 36.3.11.4 | 448.58 | t\_PE or t\_EHT-PE? There is the discrepancy between in Figure 36-34 and Equation 36-8. t\_PE should be t\_EHT-PE | As in the comment. | **Revised.**  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx) |

be editor: please make the following changes in D1.1 *Clause 36.3.11.4*:

* On P448L58 (CID #6808, #8099): replace with in Figure 36-34



Figure 36-34 – Timing Boundaries for EHT PPDU fields

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| 6809 | 36.3.11.4 | 448.51 | In Fig 36-34 (Timing boundaries for EHT PPDU fields): shouldn't "EHT-portion" include RL-SIG as well (similar to "HE portion" in Fig. 27-23)? | As in the comment. | **Rejected.**  EHT portion only covers fields which do not exist in the previous WiFi generations. RL-SIG field belongs to HE portion since it was first introduced in HE PPDU format, and it does not exist in non-HT, HT or VHT PPDU formats. With the same reason, RL-SIG is not part of EHT portion. |

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| 6810 | 36.3.11.4 | 450.15 | For pre-EHT modulated fields of an EHT TB PPDU, the power can be lower than 3dB compared to the EHT modulated portion, only if the assigned RU is 242 tones or smaller. Need to edit to reflect this fact.  The current text places no restriction on when this is allowed, whereas subsequent description of \eta\_pre-EHT places limits on RU size, thereby leading to inconsistency in the spec text. | Edit as:  "For an EHT TB PPDU, the total power of the time domain EHT modulated field signals summed over all transmit chains may exceed the total power of the time domain pre-EHT modulated field signals summed over all transmit chains by up to 3 dB, provided the assigned RU or MRU is of size 242 tones or smaller". | **Revised.**  Agree with commentor.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |

be editor: please make the following changes in D1.0 *Clause 36.3.11.4*:

* On P400L15(CID #5818):

For an EHT TB PPDU, the total power of the time domain EHT modulated field signals summed over all transmit chains may exceed the total power of the time domain pre-EHT modulated field signals summed over all transmit chains by up to 3 dB only if the size of the assigned RU or MRU is the same or smaller than 242 tones. Otherwise, the total power of the time domain EHT modulated field signals summed over all transmit chains should not exceed the total power of the time domain pre-EHT modulated field signals summed over all transmit chains.

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| 7947 | 36.3.11.4 | 450.28 | The duration of the windowing function is incorrect for fields with multiple OFDM symbols.  In Equation (36-9) and (36-10), the "Subfield" is not the entire field, but rather a single OFDM symbol. This is because: - Equation (36-9) and (36-10) do not have any index for OFDM symbol, and does not have any summation over multiple OFDM symbols.  Hence, Equation (36-9) and (36-10) are representing only one OFDM symbol. - P399L44 says the following, which means the a "Field" is the entire 'section' (e.g. the entire Data field consisting of multiple OFDM symbols), and individual OFDM symbols are the "Subfield"  "... r\_{Field}^{i\_TX}(t) is defined as the summation of one or more subfields. Each subfield ... is defined to be an inverse Fourier transform in Equation (36-9)."  Note also (as an example) that Equation (36-87) describing the EHT Data field applies the windowing function for each OFDM symbol. | At P400L28-31, - Change "T\_{U-SIG}" to "T\_{SYML}" - Change "T\_{EHT-SIG}" to "T\_{SYML}" - Change "N\_{EHT-LTF}T{EHT-LTF-SYM}" to "T\_{EHT-LTF-SYM}" - Change "N\_{SYM}T{SYM}" to "T\_{SYM}" | **Revised.**  Agree with commentor that window function only covers one OFDM symbol.  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx). |
| 5817 | 36.3.11.4 | 450.28 | For EHT-SIG field, T\_field is N\_EHT-SIG\*T\_EHT-SIG. | replacing "T\_EHT-SIG for EHT-SIG" by "N\_EHT-SIG\*T\_EHT-SIG for EHT-SIG" | **Rejected.**  in (36-8) is defined as the summation of one or more subfields. Each subfield, , in Equation (36-9) and (36-10), is defined to be an inverse Fourier transform, which essentially respresents only for one OFDM symbol. So the statement is correct. |

be editor: please make the following changes in D1.1 *Clause 36.3.11.4*:

* On P400L28(CID #7947):

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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| 7994 | 36.3.11.4 | 452.47 | Qk and Qk,u seems duplicative. | Delete the paragraph at P402L47-53, starting with "Q\_k is the spatial..." | **Revised**  Agree with the commentor that can be replaced with in Equation (36-9).  TGbe editor: Incorporate the changes in [https://mentor.ieee.org/802.11/dcn/21/11-21-1265-00-00be-CC36-CR-for-mathematical-signal-description.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-xxxx-00-00be-CC36-CR-for-mathematical-signal-description.docx) |

be editor: please make the following changes in D1.1 *Clause 36.3.11.4*:

* On P452L47(CID #7994): Delete the paragraph describing at P452L47-54.

(36-9)