IEEE P802.11
Wireless LANs

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| 11ax Comment Resolutions for Clause 26.3.8 |
| Date: 2016-08-23 |
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Abstract: This document contains proposed resolutions for comments in *Clause 26.3.8* from 11ax D0.2 with the CIDs below.

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| ***Clause 26.3.8*** |  |
| * 286 2137
* 287 288
* 289
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| * 1676 1980 1982 1983 2417 2418 2419
* 294
* 298
* 299 300 1979 2370
* 873
* 901
* 1847
* 1967
* 1968
* 1970
* 1977 1978
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***CIDs for Clause 26.3.8***

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 286 | Bin Tian | 26.3.8 | 98.40 | In HE trigger based PPDU, STA only transmits in one RU so there is no need for power boosting/deboosting among Rus. In Equation 26-5, the parameter alpha\_r and beta\_r should be removed. | As in comment. | **Revised.**Change to as in the resolution of CID286 in doc IEEE802.11-16/1136r1. |
| 2137 | Sriram Venkateswaran | 26.3.8 | 98.40 | Clarify the role of beta in UL trigger based | Is there a need for alpha/beta? | **Revised** Change to as in the resolution of CID2137 in doc IEEE802.11-16/1136r1. |

Discussions:

 is the power normalization factor depending on the number of modulated tones of a given field per RU. It should not be removed from equation 26-5. But definition of  for HE trigger based PPDU can be simplified, and  can be removed since the transmission only occupies one RU. Since  value depends on the number of modulated tones of a given field, it is more appropriate to define it as . In addition, for pre-HE fields,, which is independent of BEAM\_CHANGE value.

ax editor: please make the following changes in D0.2 *Clause 26.3.8*:

* On P98L35 (CID #286):

 In an HE trigger-based PPDU, transmitted by user-*u* in the *r*-th RU, each field,, is defined in Equation (26-5).



 is the power normalization factor and is defined in Equation (26‑6)

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|  | (26‑6) |

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 287 | Bin Tian | 26.3.8 | 99.28 | line 28 in Table 26-13, the last number for 160MHz should be 124 not 126. | As in comment. | **Accepted** |
| 288 | Bin Tian | 26.3.8 | 99.45 | line 45 in Table 26-13, the number of data tones for non-HT-DUP should be multiple of 52 | change the numbers in this row to be 52,104,208,418. | **Accepted.** |

ax editor: please make the following changes in D0.2 *Clause 26.3.8*:

* On P98L35 (CID #287): Make the following change in Table 26-13.

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| **Field** |  **as a function of bandwidth, and RU size per frequency segment** | **Guard interval duration** |
| **20 MHz** | **40 MHz** | **80 MHz** | **160 MHz** |
| HE-STF not in HE\_TRIG | 14 | 30 | 62 | 124 | - |

* On P98L45 (CID #288): Refer to comment resolution of CID #1988.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 289 | Bin Tian | 26.3.8 | 100.1 | "For pre-HE modulated fields, Kr is the set of subcarriers indices from -NSR to NSR. For HE modulated fields in a non-OFDMA HE PPDU, Kr is the set of subcarriers indices from -NSR to NSR.". NSR values for the pre-HE and HE fields should be different. Currently NSR is only defined for the HE data portion. Need some clarification text or define another NSR parameter for the Pre HE Portion. | As in comment | **Revised.**Change to as in the resolution of CID289 in doc IEEE802.11-16/1136r1. |

ax editor: please make the following changes in *Clause 26.3.8*:

* On P100L1 (CID #289):

*Kr* For pre-HE modulated fields, *Kr* is the set of subcarriers indices from *–NSR* to *NSR*, as defined in Table 26-X. For HE modulated fields in a non-OFDMA HE PPDU, *Kr* is the set of subcarriers indices from *–NSR* to *NSR*, as defined in Table 26-5.

Table 26-X Highest data subcarrier index constant *NSR* for pre-HE fields

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| **Field** | ***NSR* as a function of bandwidth** |
| **20MHz** | **40MHz** | **80MHz** | **160MHz** |
| L-STF | 26 | 52 | 104 | 208 |
| L-LTF | 26 | 52 | 104 | 208 |
| L-SIG | 28 | 56 | 112 | 224 |
| RL-SIG | 28 | 56 | 112 | 224 |
| HE-SIG-A | 28 | 56 | 112 | 224 |
| HE-SIG-B | 28 | 56 | 112 | 224 |

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 290 | Bin Tian | 26.3.8 | 101.12 | Missing word in sentenc "In HE modulated fields, in all the subcarriers.". Gama shall be always 1 for HE modulated fields. | As in comment | **Revised.**Change to as in the resolution of CID289 in doc IEEE802.11-16/1136r1. |
| 528 | Dong Guk Lee | 26.3.8 | 101.39 | it would need to be clarified the gamma value for pre-HE modulated fields | defined the gamma for pre-HE modulated field by using the Equation (21-14), Equation (21-15), Equation (21-16) and Equation (21-17) in REVmc D5.2. | **Revised.**Change to as in the resolution of CID528 in doc IEEE802.11-16/1136r1. |
| 1676 | Oghenekome Oteri | 26.3.8 | 101.47 | tone rotation for 40 and 80 MHz not defined | define tone rotation for 40 / 80 MHz | **Revised.**Change to as in the resolution of CID1676 in doc IEEE802.11-16/1136r1. |
| 1980 | Siguard Schelstraete | 26.3.8 | 101.12 | Missing part of sentence | "In HE modulated fields, in all the subcarriers." is not a sentence. Something appears to be missing. | **Revised.**Change to as in the resolution of CID1980 in doc IEEE802.11-16/1136r1. |
| 1982 | Siguard Schelstraete | 26.3.8 | 101.47 | Redefining Gamma\_k could be confusing | The notation Gamma\_k is already used for HT and VHT. If the values are going to be different form those, use a different notation. | **Revised.**Change to as in the resolution of CID1982 in doc IEEE802.11-16/1136r1. |
| 1983 | Siguard Schelstraete | 26.3.8 | 101.51 | TBD | Define. Similar on lines 41 and 49. | **Revised.**Change to as in the resolution of CID1983 in doc IEEE802.11-16/1136r1. |
| 2417 | Yongho Seok | 26.3.8 |  | For the pre-HE modulated fields, the Gamma should be determined.Use the same equation defined (21-15) for a backward compatibility. | As per comment | **Revised.**Change to as in the resolution of CID2417 in doc IEEE802.11-16/1136r1. |
| 2418 | Yongho Seok | 26.3.8 |  | For the pre-HE modulated fields, the Gamma should be determined.Use the same equation defined (21-16) for a backward compatibility. | As per comment | **Revised.**Change to as in the resolution of CID2418 in doc IEEE802.11-16/1136r1. |
| 2419 | Yongho Seok | 26.3.8 |  | For the pre-HE modulated fields, the Gamma should be determined.Use the same equation defined (21-17) for a backward compatibility. | As per comment | **Revised.**Change to as in the resolution of CID2419 in doc IEEE802.11-16/1136r1. |

* On P101L12 (CID #290CID #1980,CID#2417), On P101L47(CID #528,CID #1982,CID#2148), On P101L45(CID #1676,CID#2149): Refer to comment resolution of CID #293.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 298 | Bin Tian | 26.3.8 | 100.26 | The definition of Kr\_field is confusing. For the data field, Kr\_field should be the same as Kr. Is Kr\_HELTF the value of Kr\_Field for the HE-LTF field? What are the values for Kr\_field for the HE STF? | Add clear equations to define the Kr\_field values for HESTF, HE-LTF and HE data fields | **Revised.**Change to as in the resolution of CID289 in doc IEEE802.11-16/1136r1. |

Discussions:

It is more appropriate to define  instead of since  is used in equation (26-6). There is no need to define  separately for each field since the definition of  is clear enough to derive the value for each field. In addition, equation (26-7)

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|  | (26‑7) |

is not true for 20MHz bandwidth. So it is best to remove this wrong equation.

ax editor: please make the following changes in *Clause 26.3.8*:

* On P100L26 (CID #298): Change the definition of to definition of 

 is the cardinality of the set of modulated subcarriers within  for each field.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 299 | Bin Tian | 26.3.8 | 100.44 | Need to define the per antenna CSD values for pre-HE portion when beam\_change=1 | As in comment | **Revised.**Change to as in the resolution of CID299 in doc IEEE802.11-16/1136r1. |
| 300 | Bin Tian | 26.3.8 | 101.9 | "whose value is defined in Table 25-xx (Cyclic shift values for the HE modulated fields of a PPDU)." Need to define per stream CSD values and add a new table 26-xxx | As in comment | **Revised.**Change to as in the resolution of CID300 in doc IEEE802.11-16/1136r1. |
| 1979 | Siguard Schelstraete | 26.3.8 | 98.56 | TBD | Define | **Revised.**Change to as in the resolution of CID1979 in doc IEEE802.11-16/1136r1. |
| 2370 | Yasushi Takatori | 26.3.8 | 101.9 | There is no table for cyclic shift value for HE modulated field of a PPDU. | Add it. | **Revised.**Change to as in the resolution of CID2370 in doc IEEE802.11-16/1136r1. |

ax editor: please make the following changes in *Clause 26.3.8*:

* On P100L44 (CID #299, CID #1979): where represents the cyclic shift for the transmitter chain with a value given in Table 26-Y in 26.3.9.2.1.

**26.3.9.2 Cyclic shift for pre-HE and HE modulated fields**

ax editor: please add a new section 26.3.9.2.1 Cyclic shift for pre-HE modulate fields

**26.3.9.2.1 Cyclic shift for pre-HE modulated fields**

The cyclic shift value for the L-STF, L-LTF, L-SIG, RL-SIG, HE-SIG-A and HE-SIG-B fields of the PPDU for transmit chain out of a total of are defined in Table 26-Y.

Table 26-Y Cyclic shift value for pre-HE modulated fields

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| value for pre-HE modulated fields |
| Total number of transmit chain per Frequency segment | Cyclic shift for transmit Chain (in ns unit) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | >8 |
| 1 | 0 | - | - | - | - | - | - | - | - |
| 2 | 0 | -200 | - | - | - | - | - | - | - |
| 3 | 0 | -100 | -200 | - | - | - | - | - | - |
| 4 | 0 | -50 | -100 | -150 | - | - | - | - | - |
| 5 | 0 | -175 | -25 | -50 | -75 | - | - | - | - |
| 6 | 0 | -200 | -25 | -150 | -175 | -125 | - | - | - |
| 7 | 0 | -200 | -150 | -25 | -175 | -75 | -50 | - | - |
| 8 | 0 | -175 | -150 | -125 | -25 | -100 | -50 | -200 | - |
| >8 | 0 | -175 | -150 | -125 | -25 | -100 | -50 | -200 | Between -200 and 0 inclusive |

ax editor: please add a new section 26.3.9.2.2 Cyclic shift for HE modulate fields

**26.3.9.2.2 Cyclic shift for HE modulated fields**

The cyclic shift value for the HE-STF, HE-LTF and DATA fields of the PPDU for space-time stream *n* is defined in Table 26-Z.

Table 26-Z Cyclic shift value for HE modulated fields

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|  value for HE modulated fields |
| Total number of space-time streams  | Cyclic shift for space-time stream *n* (in ns unit) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | 0 | - | - | - | - | - | - | - |
| 2 | 0 | -400 | - | - | - | - | - | - |
| 3 | 0 | -400 | -200 | - | - | - | - | - |
| 4 | 0 | -400 | -200 | -600 | - | - | - | - |
| 5 | 0 | -400 | -200 | -600 | -350 | - | - | - |
| 6 | 0 | -400 | -200 | -600 | -350 | -650 | - | - |
| 7 | 0 | -400 | -200 | -600 | -350 | -650 | -100 | - |
| 8 | 0 | -400 | -200 | -600 | -350 | -650 | -100 | -750 |

* On P101L9 (CID #300,CID2370): whose value is defined in Table 26-Z in 26.3.9.2.2

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 873 | Zhu Jun | 26.3.8 | 100.7 | The motion is passed that HE-STF and HE-LTF power is boosted 3dB in an HE extended range SU PPDU. | Change "8 ╬╝s or 16 ╬╝s (TBD)" to "16 ╬╝s = 4 ├ù 4 ╬╝s" in this subclause. | **Revised.**Change to as in the resolution of CID873 in doc IEEE802.11-16/1136r1. |

* On P100L7 (CID #873): Refer to comment resolution of CID #526.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 901 | JUNG HOON SUH | 26.3.8 | 100.45 | Description is incorrect; Even for the case BEAM\_CHANGE is 0, for the pre-HE modulated fields, Q\_k^(i\_seq) is still a column vector | the description after "otherwise" needs to be re-written based on the reason in Comment | **Rejected.**Passed PHY motion 84 says that “when beam change indication is 0, the pre-HE-STF preamble portion shall be spatially mapped the same way as HE-LTF1 on each tone”. Q\_k^(i\_seq) can be more than one stream, hence it is not a column vector. |

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 1847 | Sameer Vermani | 26.3.8 | 103.07 | "[Q]m:n indicates a matrix consisting of columns M to N of matrix Q." the case of m,n in the symbol does not match M and N. | Make the case consistent. | **Revised.**Change to as in the resolution of CID1847 in doc IEEE802.11-16/1136r1. |

* On P96L32 (CID #1847): Refer to comment resolution of CID #1966.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 1967 | Sigurd Schelstraete | 26.3.8 | 96.62 | mention i\_TX and i\_seg | change "the actual transmitted signal" to "the actual transmitted signal on transmit chain i\_TX and frequency segment i\_seg" | **Accepted.** |

ax editor: please add a new section 26.3.9.3 Cyclic shift for HE modulate fields

* On P96L62 (CID #1967): The actual transmitted signal on transmit chain  and frequency segment  is related to the complex baseband signal by the relation shown in Equation (26‑2).

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 1968 | Siguard Schelstraete | 26.3.8 | 101.38 | correct definition of fc(iseg) | The frequencies of the segments are independent of the PPDU. Change "the center frequency of the portion of the PPDU transmitted in frequency segment iseg" to "the center frequency of frequency segment iseg" | **Accepted.** |

ax editor: please add a new section 26.3.9.3 Cyclic shift for HE modulate fields

* On P101L38 (CID #1968):

 represents the center frequency of frequency segment *iSeg*.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 1970 | Siguard Schelstraete | 26.3.8 | 97.45 | Formula (26-3) should account for the case where HE-SIG-B is not present. | Stating that t\_HE-SIG-B is undefined (as on line 51) if the PPDU is not MU doesn't work in formula (26-3) | **Revised.**Change to as in the resolution of CID1970 in doc IEEE802.11-16/1136r1. |

ax editor: please make the following changes in *Clause 26.3.8*:

* On P97L45 (CID #1970): Add a new line on P97L65 “Where  is only applicable to an HE MU PPDU.”.

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| CID | Commenter | Section | Page | Comment | Proposed Change | Resolution |
| 1977 | Siguard Schelstraete | 26.3.8 | 98.57 | notation not used in (26-4) | Contrary to what is said on line 42, the notation N^Tone\_Field is not used in (26-4). Instead N^Tone\_Field is used in the defintion of beta\_r (page 99) | **Revised.**Change to as in the resolution of CID1977 in doc IEEE802.11-16/1136r1. |
| 1978 | Siguard Schelstraete | 26.3.8 | 100.1 | |Kr| and Kr^Field are not used in (26-4), only in the definition of beta\_r | Move them to be sub-bullets of beta\_rused in the defintion of beta\_r (page 99) | **Revised.**Change to as in the resolution of CID1978 in doc IEEE802.11-16/1136r1. |

ax editor: please make the following changes in *Clause 26.3.8*:

* On P98L57 (CID #1977): Move definition of  and Table 26-13 after equation (26-6), the definition of.
* On P100L1 (CID #1978): Move definition of  and  to be the sub-bullets of .

 is the power normalization factor and is defined in Equation (26‑6)

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|  | (26‑6) |

Table 26‑13 summarizes the various values of as a function of bandwidth per frequency segment. In the case of an HE OFDMA PPDU, the value of HE-STF, HE-LTF and HE-Data fields is variable, and is determined by which RUs of the current full bandwidth are transmitted in the PPDU.

Table 26‑13 - Tone scaling factor and guard interval duration values for HE PPDU fields

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| **Field** |  **as a function of bandwidth, and RU size per frequency segment** | **Guard interval duration** |
| **20 MHz** | **40 MHz** | **80 MHz** | **160 MHz** |
| L-STF | 12 | 24 | 48 | 96 | - |
| L-LTF | 52 | 104 | 208 | 416 | *TGI2,Data* |
| L-SIG | 56 | 112 | 224 | 448 | *TGI,LegacyPreamble* |
| RL-SIG | 56 | 112 | 224 | 448 | *TGI,LegacyPreamble* |
| HE-SIG-A | 56 | 112 | 224 | 448 | *TGI,LegacyPreamble* |
| HE-SIG-B | 56 | 112 | 224 | 448 | *TGI,LegacyPreamble* |
| HE-STF not in HE\_TRIG | 14 | 30 | 62 | 126 | - |
| HE-STF in HE\_TRIG | 30 | 60 | 124 | 248 | - |
| HE-LTF 1x Duration | 60 | 122 | 250 | 500 | *TGI,HE-LTF1* |
| HE-LTF 2x Duration | 122 | 242 | 498 | 996 | *TGI,HE-LTF2* |
| HE-LTF 4x Duration | 242 | 484 | 996 | 1992 | *TGI,HE-LTF4* |
| HE-Data | 242 | 484 | 996 | 1992 | *TGI,Data* or *TGI2,Data* or *TGI4,Data* |
| NON\_HT\_DUP\_OFDM-Data | 56 | 112 | 224 | 448 | *TGI,LegacyPreamble* |
| NOTE--in the case of an HE OFDMA PPDU, the value of HE-STF, HE-LTF and HE-Data fields is variable, and is determined by which RUs of the current full bandwidth are transmitted in the PPDU. |

 is the cardinality of the set of subcarriers *Kr*

is the cardinality of the set of modulated subcarriers within for each field.