IEEE P802.11  
Wireless LANs

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| Proposed Changes for Clause 26 of 11ax D0.5 | | | | |
| Date: 2016-10-23 | | | | |
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Abstract: This document contains proposed changes for 11ax D0.5.

**Proposed change 1: 26.1.1 Introduction to HE PHY**

**Discussion:** PHY Motion #158 is not completely implemented in terms of MCS range in the following two sub-bullets:

"-LDPC coding for 26-, 52-, 106- and 242-tone RUs (transmit and receive) when the number of spatial streams is less than or equal to 4;

- LDPC coding for a 20 MHz HE SU PPDU (transmit and receive) when the number of spatial streams is less than or equal to 4"

ax editor: please make the following changes in D0.5 *Clause 26.1.1*:

* On P164L21:

LDPC coding for 26-, 52-, 106- and 242-tone RUs (transmit and receive) for MCS0~MCS9 when the number of spatial streams is less than or equal to 4

LDPC coding for a 20 MHz HE SU PPDU (transmit and receive) for MCS0~MCS9 when the number of spatial streams is less than or equal to 4

**Proposed change 2: 26.3.8 Timing-related Parameters**

**Discussion:** GI for L-LTF is defined as TGI,L-LTF, TGI2,Data should not be used for definition of TL-LTF in Table 26-9.

ax editor: please make the following changes in D0.5 *Clause 26.3.8 Table 26-9*:

* On P202L10:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Values** | **Description** |
|  |  | Non-HT Long Training field duration |

**Proposed change 3: 26.3.9 Mathematical description of signals**

**Discussion:** “ is the power boost factor for per OFDM symbol, which is sqrt(2) for the L-STF, L-LTF, HE-STF and HE-LTF fields in the HE extended range SU PPDU, and 1 otherwise". This statement is not completely accurate.  is the power boost factor for kth tone of a given field within an OFDM symbol. And its value is sqrt(2) instead of 1 for 4 edge tones of (k = -28, -27, 27 ,28) L-LSIG field in the HE extended rangle SU PPDU as well.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P209L01:

 is the power boost factor of the *k*th tone of a given field within an OFDM symbol, which is  for the L-STF, L-LTF, HE-STF and HE-LTF fields in the HE extended range SU PPDU, and 1 for HE-SIGA, HE-SIGB and Data fields for all . Specifically, for L-SIG and RL-SIG fields



**Proposed change 4: 26.3.10.9 HE-STF**

**Discussion:** HE-STF equations for different bandwidths is from (26-25) to (26-34) instead of (26-32).

ax editor: please make the following changes in D0.5 *Clause 26.3.10.9*:

* On P244L22:

For an OFDMA transmission, the coefficients in Equation (26-25) to Equation (26-34) are set to zero if those values are corresponding to tone indices for which no RUs are defined (see 26.3.9 (Mathematical description of signals)).

**Proposed change 5: 26.3.10.9 HE-STF**

**Discussion:** In Equations (26-35) and (26-36), k belongs to Kr instead of K. In equation (26-36), can be removed for trigger based PPDU since the transmission only occupies one RU. In passed motion of CR #286, it is agreed that **** should be removed from trigger-based PPDU equation.

ax editor: please make the following changes in D0.5 *Clause 26.3.10.9*:

* On P244L38 and P245L01:

 (26-35)

The time domain representation of the signal for HE trigger-based PPDUs, transmitted by user-u in the rth RU, on frequency segment  of transmit chain  shall be as specified in Equation (26-36).

 (26-36)

**Proposed change 6: 26.3.10.10 HE-LTF**

**Discussion:** "In an HE MU PPDU with more than one RU and an HE trigger-based PPDU, NHE-LTF(#922) may take any value among one, two, four, six or eight, which is greater than or equal to the maximum value of the function in Table 26-12(Frequently used parameters(#282)) when it is calculated for each NSTS,r,total separately." This statement is very confusing about the function in Table 26-12.

ax editor: please make the following changes in D0.5 *Clause 26.3.10.10*:

* On P245L47:

In an HE MU PPDU, (#922) is indicated in the HE-SIG-A field. In an HE MU PPDU with more than one RU and an HE trigger-based PPDU, (#922) may take any value among one, two, four, six or eight, which is greater than or equal to the maximum value ofthe initial number of HE-LTF symbols for each r, which is calculated as a function of , separately.

**Proposed change 7: 26.3.11.2 pre-FEC encoding process**

**Discussion:** Equation (26-64) is redundant since  is defined for both BCC and LDPC.

ax editor: please make the following changes in D0.5 *Clause 26.3.11.2*:

* On P260L12:

For a HE SU PPDU, the number of pre-FEC pad bits is calculated using Equation (26‑63).

|  |  |
| --- | --- |
|  | (26‑63) |

where is defined as in Equation (26‑66) for BCC encoding, and Equation (26‑71) for LDPC encoding.



**Proposed change 8: 26.3.11.5.4 Encoding process for an HE MU PPDU**

**Discussion:**  should be 

ax editor: please make the following changes in D0.5 *Clause 26.3.11.5.4*:

* On P263L26:

First compute initial pre-FEC padding factor(#2564) value () for each user u using Equation (26-61), and the initial number of OFDM symbols ()(#2071) for each user u using Equation (26-66) if user u is BCC encoded, or Equation (26-71) if user u is LDPC encoded.

**Proposed change 9: 26.3.11.5.4 Encoding process for an HE MU PPDU**

**Discussion:**  should be 

ax editor: please make the following changes in D0.5 *Clause 26.3.11.5.4*:

* On P263L37:

Then the common  and  values among all the users are derived by Equation (26-79):

**Proposed change 10: 26.3.11.5.4 Encoding process for an HE MU PPDU**

**Discussion:** "Note that users with BCC encoding shall also use the common  and a parameters as in

Equation (26-86)". “a parameter” is “pre-FEC padding parameters” based on motioned passed in last September F2F meeting. This explanation applies to Equation (26-87) instead of (26-86).

ax editor: please make the following changes in D0.5 *Clause 26.3.11.5.4*:

* On P264L47:

Note that users with BCC encoding shall also use the common and pre-FEC padding parameters as in Equation (26-87)

**Proposed change 11: 26.3.11.5.4 Encoding process for an HE MU PPDU**

**Discussion:** "For the users with LDPC encoding, ." This statement is also true for BCC encoding since  for BCC encoding. It is more concise to include BCC in this statement instead of writing separate descriptions for LDPC and BCC. The statement and equation for BCC encoding can be removed from spec.

ax editor: please make the following changes in D0.5 *Clause 26.3.11.5.4*:

* On P264L50:

For the users with either BCC or LDPC encoding, .

**Proposed change 12: 26.3.11.5.4 Encoding process for an HE MU PPDU**

**Discussion:** "For the users with LDPC encoding, the number of pre-FEC padding bits is shown in Equation (26-81)." It is also true for BCC encoding if  value is included in equation (26-81). Then the statement and equation (26-88) for BCC encoding can be removed to reduce redundancy.

ax editor: please make the following changes in D0.5 *Clause 26.3.11.5.4*:

* On P263L55:

For the users with either BCC or LDPC encoding, the number of pre-FEC padding bits is shown in Equation (26-81):



* On P265L01

**Proposed change 13: 26.3.11.5.5 Encoding process for an HE trigger based PPDU**

**Discussion:** “For an HE trigger-based PPDU with BCC encoding, follow the HE SU PPDU padding and encoding process as introduced in 25.3.10.1.1 (pre-FEC padding process)" The clause for pre-FEC padding process is 26.3.11.2. In addition, the naming for 26.3.11.2 is confusing. It should be named as pre-FEC padding process instead of pre-FEC encoding process since it only involves padding process instead of encoding process.

ax editor: please make the following changes in D0.5 *Clause 26.3.11.5.5*:

* On P265L35:

For an HE trigger-based PPDU with BCC encoding, follow the HE SU PPDU padding and encoding process as introduced in 26.3.11.2(pre-FEC padding process),

* On P257L42:

**26.3.11.2 Pre-FEC padding process**

**Proposed change 14: 26.3.14 OFDM modulation**

**Discussion: ** should be removed for trigger-based PPDU since the transmission only occupies one RU.

ax editor: please make the following changes in D0.5 *Clause 26.3.11.14*:

* On P280L17:

 (26-115)

**Proposed change 15: 26.4.2 TXTIME and PSDU\_LENGTH calculation**

**Discussion:** Subscript u is missed for  and  in equation 26-133, and the following two sentences.

ax editor: please make the following changes in D0.5 *Clause 26.4.2*:

* On P310L27:

The value of the PSDU\_LENGTH parameter for user *u* returned in the PLME-TXTIME.confirm primitive and in the RXVECTOR for a HE MU PPDU is calculated using Equation (26‑133).

|  |  |
| --- | --- |
|  | (26‑133) |

|  |
| --- |
| (26-133) |

where

 is given by Equation (26‑79)

is given by Equation (26‑80)

**Proposed change 16: 26.3.10.8.4 HE-SIG-B common content**

**Discussion:** "Number of user fields in each RU in the HE-SIG-B content channel: the number of users multiplexed in the RUs indicated by the arrangement; for RUs of size greater than or equal to 106 tones that support MU-MIMO, it indicates the number of users multiplexed using MU-MIMO." The explanation is for "Number of user fields in each 20MHz PPDU", not "each RU".

ax editor: please make the following changes in D0.5 *Clause 26.3.10.8.4*:

* On P235L04:

— Number of user fields in a 20MHz PPDU BW within the HE-SIG-B content channel: the number of users multiplexed in the RUs indicated by the arrangement; for RUs of size greater than or equal to 106 tones that support MU-MIMO, it indicates the number of users multiplexed using MU-MIMO.

**Proposed change 17: 26.3.9 Mathematical description of signals**

**Discussions:** |Kr| should be the cardinality of set of subcarriers of Kr excluding DC subcarriers.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P208L32:

Kr For pre-HE modulated fields, Kr(#2760) is the set of subcarriers indices from – to  as defined in Table 26-13 excluding DC subcarriers (Highest data subcarrier index  for pre-HE modulated fields).(#289) For HE modulated fields in a non-OFDMA HE PPDU, Kr is the set of subcarriers indices from – to  as defined in Table 26-10 (Tone allocation related constants for Data field in a non-OFDMA HE PPDU)(#289) excluding DC subcarriers. For HE modulated fields in an OFDMA HE PPDU, Kr is the set of subcarrier indices for the tones in the r-th RU excluding DC subcarriers.

**Proposed change 18: 26.3.10.10 HE-LTF**

**Discussions:** Similar to other fields, a separate equation without power boost fact  should be included in the spec for HE-LTF field of an HE trigger based PPDU. In equation (26-59),  should be placed after *k* index summation.  should be removed from the equation since it is not defined, and replace  with  in the equation to take care of different HE-LTF modes.

ax editor: please make the following changes in D0.5 *Clause 26.3.10.10*:

* On P256L61:

In an HE SU PPDU, HE MU PPDU, and HE extended range SU PPDU (#1059), the time domain representation of the waveform transmitted on frequency segment  of transmit chain shall be as described by Equation (26-59)

(26-59)

In an HE trigger based PPDU, the time domain representation of the waveform of user-u in the rth RU, transmitted on frequency segment  of transmit chain shall be as described by Equation (26-xx)

(26-xx)

**Proposed change 19: 26.3.17 HE transmit procedure**

**Discussions:** “Signal Extension is 0 us when TXVECTOR parameter NO\_SIG\_EXTN is true and is aSignalExtension as defined in Table xxx of 26.3 (HE PHY) when TXVECTOR parameter NO\_SIG\_EXTN is false.” Table xxx of 26.3 (HE PHY) does not exist. It should be replaced with correct reference.

ax editor: please make the following changes in D0.5 *Clause 26.3.17*:

* On P308L55:

Signal Extension is 0μs when TXVECTOR parameter NO\_SIG\_EXTN is true and is aSignalExtension as defined in Table 19-25 (HT PHY characteristics) when TXVECTOR parameter NO\_SIG\_EXTN is false.

**Proposed change 20: 26.3.8 Timing-related parameters**

**Discussions:** There are typos of in table 26-12, to be fixed.

ax editor: please make the following changes in D0.5 *Clause 26.3.8*:

* On P204L42:

|  |  |
| --- | --- |
| **Symbol** | **Explanation** |
|  | For pre-HE modulated fields, = 1. For HE modulated fields,  represents the total number of users at r-th RU in the transmission (summing over all RUs equals to the TXVECTOR parameter NUM\_USERS\_TOTAL). |

**Proposed change 21: 26.3.9 Mathmetical descriptions of signals**

**Discussions:** “In an HE SU PPDU, HE MU PPDU and HE extended range SU PPDU, for each field excluding the PE field,  is defined in Equation (26-3) and Equation (26-4) as the summation of one or more subfields”. Equation (26-4) is for HE trigged based PPDU, and it should be removed from this sentence.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P207L49:

In an HE SU PPDU, HE MU PPDU and HE extended range SU PPDU, for each field excluding the PE field,  is defined in Equation (26-3) as the summation of one or more subfields.

**Proposed change 22: 26.3.9 Mathmetical descriptions of signals**

**Discussions:** "For pre-HE modulated fields, Kr(#2760) is the set of subcarriers indices from  to  as defined in Table 26-13". The values in Table 26-13 are incorrect for 40, 80 and 160MHz.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P208L33:

Table 26-13 Highest data subcarrier index constant *NSR* for pre-HE fields

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Field** | ***NSR* as a function of bandwidth** | | | |
| **20MHz** | **40MHz** | **80MHz** | **160MHz** |
| L-STF | 26 | 58 | 122 | 250 |
| L-LTF | 26 | 58 | 122 | 250 |
| L-SIG | 28 | 60 | 124 | 252 |
| RL-SIG | 28 | 60 | 124 | 252 |
| HE-SIG-A | 28 | 60 | 124 | 252 |
| HE-SIG-B | 28 | 60 | 124 | 252 |

**Proposed change 23: 26.3.9 Mathmetical descriptions of signals**

**Discussions:**  is only meaningful for HE DL MU PPDU. For HE SU PPDU, HE extended range SU PPDU and HE trigger based PPDU,  is always 1. It should make it clear in the description of .

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P209L11:

 is the power boost factor for the r-th RU in an HE PPDU. For an HE DL MU PPDU, a STA shall support  in the range [0.7,] and a STA may support  in the range [0.5, 2]. For HE SU PPDU, HE extended range SU PPDU and HE trigger-based PPDU,  is always set to 1.

**Proposed change 24: 26.3.9 Mathmetical descriptions of signals**

**Discussions:**  for HELTF field is not accurate in the spec. The per tone power of HELTF field should be the same as that of Data field regardless whether HELTF4x, HELTF2x or HELTF1x is transmitted.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P209L29:

 is the cardinality of the set of subcarriers modulated with data within *Kr* for HESTF and Data fields. For HELTF field, it is set as.

**Proposed change 25: 26.3.9 Mathmetical descriptions of signals**

**Discussions:** “where  represents the cyclic shift for the transmitter chain whose values are TBD”. TBD should be replaced with the correct reference.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P210L41:

where  represents the cyclic shift for the transmitter chain whose values aredefined in 26.3.10.2.1;

**Proposed change 26: 26.3.9 Mathmetical descriptions of signals**

**Discussions:** “ given in Table 26-3”. It should be Table 26-9.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P210L47:

 given in Table 26-9.

**Proposed change 27: 26.3.9 Mathmetical descriptions of signals**

**Discussions:** “whose value is defined in Table 25-xx (Cyclic shift values for the HE modulated fields of a PPDU).” Table 25-xx does not exist. It should be replaced with the correct reference.

ax editor: please make the following changes in D0.5 *Clause 26.3.9*:

* On P211L07:

For HE modulated fields,  represents the cyclic shift per space-time stream, whose value is defined in 26.3.10.2.2(Cyclic shift values for the HE modulated fields of a PPDU).

**Proposed change 28: 25.6.2 Rules for HE sounding protocol sequences**

**Discussions:** "A non-AP HE beamformee that receives a HE NDP Announcement frame for a HE beamformer with which it is associated and that contains the HE beamformee's AID in the AID subfield of STA Info field, and there is only one STA Info field, shall transmit its HE Compressed beamforming feedback SIFS after receiving the

HE NDP". The statement is not correct. It also applies AP since AP can be an HE SU beamformee as well.

ax editor: please make the following changes in D0.5 *Clause 25.6.2*:

* On P142L44:

An HE beamformee that receives an HE NDP Announcement frame from an HE beamformer with which it is associated and that contains the HE beamformee's AID in the AID subfield of STA Info field, and there is only one STA Info field, shall transmit its HE Compressed beamforming feedback SIFS after receiving the HE NDP.