IEEE P802.11  
Wireless LANs

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| TGba D1.0 Comment Resolutions for Sec. 32.2.4 and 32.8.2 (WUR Preamble) | | | | |
| Date: 2019-01-14 | | | | |
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Abstract

This submission proposes resolutions for comments received on WUR Legacy portion of TGba D1.0. The following is the list of CIDs:

* 189, 195, 226, 264, 304, 305, 446, 925, 987, 1205, 1206, 1212

***CIDs for Clause 32.2.4***

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 189 | 32.2.4.2 | 74.38 | The construction of L-STF L-LTF and L-SIG doesn't discuss the FDMA case (eg. reference 17.3.3 doesn't even have 80MHz case). Probably better to reorganize the 32.2.4 into two sepearted clause: single 20MHz WUR PPDU encoding process and FDMA 20MHz WUR PPDU encoding process. The later one can just simply say that each 20Mhz is genreated independently. L-LEnght is the same. Phase rotation applies to each 20MHz to reduce PAPR. Padding is applied to align the length | as in the comment | Revised-  Agree in principle with the commenter that the text need to cover packet format of both WUR PPDU and FDMA PPDU. Rewrite the construction of L-STF, L-LTF, and also L-SIG and RL-SIG.  TGba editor to make the changes shown in 11-19/0014r0. |
| 1205 | 32.2.4.2 | 74.41 | (19-8) and (17-6) show different scaling factor. Better remove 17.3.3 (PHY preamble (SYNC)) for Construction of L-STF. Better to leave 21.3.4.2 (Construction of L-STF) like the case at P81L29. Same to L-LTF and L-SIG. | as in comment | Revised.  Agreed that the reference sections are not appropriate for WUR legacy preamble construction. Rewrite the construction of L-STF, L-LTF, and also L-SIG and RL-SIG.  TGba editor to make the changes shown in 11-19/0014r0. |
| 226 | 32.2.4.4 | 74.54 | the different features are considered in 11ax for construction of the L-SIG. so, It is not appropriate to include 11ax. | delete the reference of 28.3.10.5 (L-SIG). | Accepted. |
| 1206 | 32.2.4.4 | 74.54 | remove 28.3.10.5 (L-SIG) which is from a draft spec. (e.g. 11ax draft) | as in comment | Accepted. |

**Discussion:**

WUR allows WUR PPDU with 20MHz signal bandwidth, FDMA PPDU with 40MHz, FDMA PPDU with 80MHz and with sub-channel puncturing. The reference VHT section of 21.3.4 for the legacy preamble construction does NOT cover the FDMA PPDU with sub-channel puncturing. Need to rewrite all sections for WUR legacy preamble similar to 802.11ax standards in Sec. 28.3.6.

*TGba Editor: Please make the following changes (in red) in Section 32.2.4 Overview of the PPDU encoding process of D1.0:*

* Overview of the PPDU encoding process
* Construction of the L-STF

Construct the L-STF field as defined in 32.2.8.2.1 (L-STF) with the following highlights:

1. Determine the channel bandwidth from the TXVECTOR parameter CH\_BANDWIDTH.
2. Sequence generation: Generate the L-STF sequence over the CH\_BANDWIDTH as described in 32.2.8.2.1 (L-STF Definition)
3. Phase rotation: Apply appropriate phase rotation for each 20 MHz subchannel as described in 21.3.7.4 (Transmitted signal) and 21.3.7.5 (Definition of tone rotation).
4. IDFT: Compute the inverse discrete Fourier transform
5. CSD: Apply CSD for each transmit chain and frequency segment as described in 21.3.8.2.1 (Cyclic shift for pre-VHT modulated fields).
6. Insert GI and apply windowing: Prepend a GI (LONG\_GI) and apply windowing as described in 21.3.7.4 (Transmitted signal).
7. Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 21.3.7.4 (Transmitted signal) and 21.3.8 (VHT preamble) for details.

* Construction of the L-LTF

Construct the L-LTF field as defined in 32.2.8.2.2 (L-LTF definition) with the following highlights:

1. Determine the CH\_BANDWIDTH from the TXVECTOR.
2. Sequence generation: Generate the L-LTF sequence over the CH\_BANDWIDTH as described in 32.2.8.2.2 (L-LTF definition).
3. Phase rotation: Apply appropriate phase rotation for each 20 MHz subchannel as described in 21.3.7.4 (Transmitted signal) and 21.3.7.5 (Definition of tone rotation).
4. IDFT: Compute the inverse discrete Fourier transform.
5. CSD: Apply CSD for each transmit chain and frequency segment as described in 21.3.8.2.1 (Cyclic shift for pre-VHT modulated fields).
6. Insert GI and apply windowing: Prepend a GI (2 x LONG\_GI) and apply windowing as described in 21.3.7.4 (Transmitted signal).
7. Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 21.3.7.4 (Transmitted signal) and 21.3.8 (VHT preamble) for details.

* Construction of the L-SIG

Construct the L-SIG defined in 32.2.8.2.3 (L-SIG Definition) with the following highlights:

1. In a WUR PPDU, set the RATE subfield in the SIGNAL field to 6 Mb/s. Set the Length, Parity, and Tail bits in the SIGNAL field as described in 32.2.8.2.3 (L-SIG Definition)
2. BCC encoder: Encode the L-SIG field by a convolutional encoder at the rate of R=1/2 as described in 21.3.10.5.3 (Binary convolutional coding and puncturing).
3. BCC interleaver: Interleave as described in 21.3.10.8 (BCC interleaver).
4. Constellation Mapper: BPSK modulate as described in 21.3.10.9 (Constellation mapping).
5. Pilot insertion: Insert pilots as described in 21.3.10.11 (OFDM modulation).
6. Duplication and phase rotation: Duplicate the L-SIG field over the occupied 20 MHz subchannel of the CH\_BANDWIDTH. Apply appropriate phase rotation for each 20 MHz subchannel as described in 21.3.7.4 (Transmitted signal) and 21.3.7.5 (Definition of tone rotation).
7. IDFT: Compute the inverse discrete Fourier transform.
8. CSD: Apply CSD for each transmit chain and frequency segment as described in 21.3.8.2.1 (Cyclic shift for pre-VHT modulated fields).
9. Insert GI and apply windowing: Prepend a GI (LONG\_GI) and apply windowing as described in 21.3.7.4 (Transmitted signal) .
10. Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 21.3.7.4 (Transmitted signal) and 21.3.8 (VHT preamble) for details.

* Construction of the RL-SIG

Construct the RL-SIG field as the repeat SIGNAL field defined in 32.2.8.2.5 (RL-SIG Definition) with the following highlights:

* In a WUR PPDU, set the RL-SIG field as described in 32.2.8.2.5 (RL-SIG Definition).
* BCC encoder: Encode the RL-SIG field by a convolutional encoder at the rate of R=1/2 as described in 21.3.10.5.3 (Binary convolutional coding and puncturing).
* BCC interleaver: Interleave as described in 21.3.10.8 (BCC interleaver).
* Constellation Mapper: BPSK modulate as described in 21.3.10.9 (Constellation mapping).
* Pilot insertion: Insert pilots as described in 21.3.10.11 (OFDM modulation).
* Duplication and phase rotation: Duplicate the RL-SIG field over each occupied 20 MHz of the CH\_BANDWIDTH. Apply appropriate phase rotation for each 20 MHz subchannel as described in 21.3.7.4 (Transmitted signal) and 21.3.7.5 (Definition of tone rotation).
* IDFT: Compute the inverse discrete Fourier transform.
* CSD: Apply CSD for each transmit chain and frequency segment as described in 21.3.8.2.1 (Cyclic shift for pre-VHT modulated fields).
* Insert GI and apply windowing: Prepend a GI (LONG\_GI) and apply windowing as described in 21.3.7.4 (Transmitted signal) .
* Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 21.3.7.4 (Transmitted signal) and 21.3.8 (VHT preamble)for details.

***CIDs for Clause 32.2.8***

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 195 | 32.2.8.2.1 | 81.49 | May want to reference to Clause 21 instead of Clause 17 since clause 17 only has 20MHz mode. The following equatios in this subclause also more related clause 21 | as in the comment | Revised-  Agree in principle with the commenter that the current text does NOT cover both packet formats: WUR PPDU and FDMA PPDU. Rewrite description of L-STF, L-LTF, and also L-SIG and RL-SIG.  TGba editor to make the changes shown in 11-19/0014r0. |
| 264 | 32.2.8.2.1 | 84.63 | BPSK-Mark was defined as repeated L-SIG. As in 11ax, use "RL-SIG" instead of "BPSK-Mark". | Change the title of 32.2.8.2.1 to RL-SIG and modify the content in section 32.2.8.2.1 as in 28.3.10.6 (RL-SIG) in 11ax. | Accepted. |
| 304 | 32.2.8.2.1 | 85.24 | The text "The bits in the BPSK Mark field shall be the same as the bits of the L-SIG field" in lines 24 ff implies (if I'm not mistaken) that the BPSK-MARK symbol is sample-for-sample identical to the LSIG symbol. It is not incorrect to repeat the full mathematical description for an arbitrary BPSK OFDM symbol, but it suggests more freedom than the implementer actually has. | State the the BPSK mark symbol is a repetition of the LSIG symbol. | Accepted. |
| 305 | 32.2.8.2.1 | 85.29 | A reference is made to 17.3.5.9 which talks about 'pseudo-binary' numbers. | Specify that 'pseudo binary numbers' should be read as 'pseudo-random binary numbers'. | Rejected.  The requested change is not related to 802.11ba standard draft. Please make the comment to 802.11REVmd. |
| 446 | 32.2.8.2 | 81.26 | "All of these fields are 20 MHz channel width." not clear. | changes to "All of these fields are transmitted using 20 MHz channel bandwidth." | Revised.  Agree that the statement is not correct, especially when considering FDMA mode. It is deleted.  TGba editor to make the changes shown in 11-19/0014r0. |
| 925 | 32.2.8.2 | 81.22 | For FDMA preamble puncture cases, the 20MHz portion of the preamble will not occupy the entire 80MHz bandwidth. | May need to rewrite according to the corresponding 11ax spec for legacy preamble and BPSK-Mark generation. | Revised  Rewrite the 32.2.8.2 to cover both WUR PPDU and FDMA PPDU. |
| 987 | 32.2.8.2.1 | 81.46 | The BPSK-Mark field may include more information to help the WUR operation. | Define BPSK-Mark information bits rather than repeating L-SIG information | Rejected.  Current text correctly reflects the passed motion in 11-18/1638r2. |
| 1212 | 32.2.8.2 | 81.36 | In "The value of TXTIME used in 21.3.8.2.4 (L-SIG definition) is described in 32.3.1 (TXTIME and PSDU length calculation).", delete "used in 21.3.8.2.4 (L-SIG definition)". TXTIME is defined properly in 32.3.1. | as in comment | Accepted. |

**Discussion:**

WUR allows WUR PPDU with 20MHz signal bandwidth, FDMA PPDU with 40MHz, FDMA PPDU with 80MHz and with sub-channel puncturing. The reference VHT sections of 21.3.4 and 21.3.8.2 for the legacy preamble construction does NOT cover the FDMA PPDU with sub-channel puncturing. Need to rewrite all sections for WUR legacy preamble similar to 802.11ax standards in Sec. 28.3.10.

*TGba Editor: Please make the following changes (in red) in Section 32.2.8.2 Non-WUR portion of WUR PHY preamble in D1.0:*

* Non-WUR portion of WUR PHY preamble

The Non-WUR portion of the WUR PHY preamble consists of four fields: L-STF, L-LTF, L-SIG and RL-SIG..

**32.2.8.2.1 L-STF Definition**

The time domain representation of the L-STF field, transmitted on transmit chain , shall be as specified in Equation (32-x1).

(32-x1)

where

has the value given in Table 21-8 (Tone scaling factor and guard interval duration values for PHY fields).

represents the cyclic shift for transmit chain with a value given in Table 21-10 (Cyclic shift values for L-STF, L-LTF, L-SIG, and VHT-SIG-A fields of the PPDU)

is the set of 20MHz sub-channels that are occupied.

is the index of 20MHz sub-channel, , and is the number of 20 MHz sub-channels in the bandwidth indicated by dot11CurrentChannelWidth.

is defined as in Equation (19-8).

is defined by Equation (21-14), Equation (21-15) and Equation (21-16).

is the subcarrier frequency spacing given in Table 21-5 (Timing-related constants).

**32.2.8.2.2 L-LTF Definition**

The time domain representation of the L-LTF field, transmitted on transmit chain , shall be as specified in Equation (32-x2).

(32-x2)

where

has the value given in Table 21-8 (Tone scaling factor and guard interval duration values for PHY fields).

is defined as in Equation (17-8).

Other variables are defined below Equation (32-x1).

**32.2.8.2.3 L-SIG Definition**

The L-SIG field is used to communicate rate and length information. The structure of the L-SIG field is defined in Figure 17-5 (SIGNAL field bit assignment).

In a WUR PPDU, the RATE field shall be set to the value representing 6 Mb/s in the 20 MHz channel spacing column of Table 17-6 (Contents of the SIGNAL field). In a non-HT duplicate PPDU, the RATE field is defined in 17.3.4.2 (RATE field) using the L\_DATARATE parameter in the TXVECTOR.

The LENGTH field shall be set to the value given by Equation (21-24). The value of TXTIME is described in 32.3.1 (TXTIME and PSDU length calculation). The value of the L-SIG Length field shall be divisible by 3.

The LSB of the binary expression of the Length value shall be mapped to B5. In a non-HT duplicate PPDU, the LENGTH field is defined in 17.3.4.3 (PHY LENGTH field) using the L\_LENGTH parameter in the TXVECTOR.

The Reserved (R) field shall be set to 0.

The Parity (P) field has the even parity of bits 0-16.

The SIGNAL TAIL field shall be set to 0.

The L-SIG field shall be encoded, interleaved, and mapped following the steps described in 17.3.5.6 (Convolutional encoder), 17.3.5.7 (Data interleaving), and 17.3.5.8 (Subcarrier modulation mapping). The stream of 48 complex numbers generated by these steps is denoted by . Pilots shall be inserted as described in 17.3.5.9 (Pilot subcarriers).

The time domain representation of the L-SIG field, transmitted on transmit chain , shall be as specified in Equation (32-x4).

(32-x3)

where

has the value given in Table 21-8 (Tone scaling factor and guard interval duration values for PHY fields).

is defined in 17.3.5.10 (OFDM modulation)

is the first pilot value in the sequence defined in 17.3.5.10 (OFDM modulation)

Other variables are defined below Equation (32-x1).

32.2.8.2.4 RL-SIG Definition

The RL-SIG field is a repeat of the L-SIG field and is used to spoof HT devices from false packet type detection.

The time domain representation of the L-SIG field, transmitted on transmit chain , shall be as specified in Equation (32-x4).

(32-x4)

where

is the second pilot value in the sequence defined in 17.3.5.10 (OFDM modulation)

Other variables are defined below Equation (32-x1) and Equation (32-x3).