IEEE P802.11  
Wireless LANs

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | LB253 Misc. Comments – Part 2 | | | | | | Date: 2021-07-14 | | | | | | Author(s): | | | | | | Name | Affiliation | Address | Phone | email | | Youhan Kim | Qualcomm |  |  | [youhank@qti.qualcomm.com](mailto:youhank@qti.qualcomm.com) | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |

Abstract

This submission proposes resolutions for the following comments from comment collection on P802.11az D3.0:

5465, 5475

NOTE – Set the Track Changes Viewing Option in the MS Word to “All Markup” to clearly see the proposed text edits.

**Revision History:**

R0: Initial version.

R1: Updated proposed text for CID 5475 (missed definition for L\_{k,u}).

R2: Fixed document number reference.

R3: Updated during meeting on 7/14/2021.

# CID 5465

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5465 | 27.3.18a | 224.26 | What is "zero-power GI"? There is no definition. | Define zero-power GI. |

**Discussion**

Context:

11az D3.1 P234:

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11az D3.1 P236:

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11az D3.1 P242-243:

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| … |

Figures 27-46c, 27-46d and 27-46f also use the term “zero-power GI”.

Note that in case of PE, the content of PE is arbitrary, other than the requirements that it “shall be transmitted with the same average power as the Data field and shall not cause significant power leakage outside of the spectrum used by the Data field” (27.3.13 - REVme D0.1 P4056L5). Hence, PE does not have even have a “GI”.

**Proposed Resolution: CID 5465**

**Revised**.

**Note to commenter:**

The instruction to editor below defines the term zero-power GI, and also fixes the incorrect use of the term GI in PE.

**Instruction to TGaz editor:**

Make the changes as shown in <https://mentor.ieee.org/802.11/dcn/21/11-21-1155-03-00az-lb253-misc-comments-part-2.docx> for CID 5465.

**Proposed Text Updates: CID 5465**

27.3.18a.1 HE Ranging NDP

*Instruction to TGaz Editor: Change TGaz D3.1 P234L3 as shown below:*

* Has a Packet Extension (PE) field that is 4 µs in duration. No energy is transmitted during the first 1.6 µs of the PE field if the HE-LTF field is using the secure HE-LTF, similar to no energy being transmitted during the GI of HE-LTF symbols.

*Instruction to TGaz Editor: Change TGaz D3.1 P234L19 as shown below:*

The only supported mode is 2x HE-LTF with 1.6 µs GI. The other combinations of HE-LTF modes and GI duration are disallowed. No energy is transmitted during the GI of the HE-LTF symbols when secure HE-LTF is used, which is referred to as a zero-power GI.

*Instruction to TGaz Editor: Change TGaz D3.1 P236L12 as shown below:*

* Has a Packet Extension (PE) field that is 4 µs in duration. No energy is transmitted during the first 1.6 µs of the PE field if the HE-LTF field is using the secure HE-LTF, similar to no energy being transmitted during the GI of HE-LTF symbols.

# CID 5475

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5475 | 27.3.18d | 233.35 | There is no equation making use of w\_FD(k).  Also, there is no equation defining the zero-power GI. | In 27.3.18d, add an equation similar to Equation (27-58), but making use of w\_FD(k).  Also, that equation should not use the time domain windowing function w\_{T\_{HE-LTF}} which eventually can be traced back to Equation (17-4) which means that the GI has non-zero energy (equal energy per sample as the useful FFT duration). So a new time domain windowing function would have to be defined for this new equation which makes the GI have zero energy. |

**Discussion**

11az D3.1 P242:

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11az uses the name  to refer to a frequency domain windowing function. However, the baseline IEEE 802.11 standard uses the name  to refer to time domain windowing function, where the “*T*Subfield” is replaced by many terms representing the various fields of a PPDU. Hence, it is easy to confuse that  is another time domain windowing function for a field of duration “FD”. Hence, the proposal is to change  to .

And yes, the commenter is correct that there is no equation using . In fact, there is no equation representing the time domain waveform of any HE Ranging NDPs. It really does not matter how a transmitter implements various blocks as long as the final time domain waveform being transmitted is ‘correct’. Hence, a precise mathematical description of the time domain waveform is an essential part of a standard. For now, this document adds the equation representing the time domain waveform for the secure HE-LTF which is the case most different from the ‘baseline’ 11ax waveforms. That equation also mathematically describes what the zero-power GI is. TGaz group should look into adding time domain representation for other HE ranging waveforms as well.

**Proposed Resolution: CID 5475**

**Revised**.

**Note to Commenter:**

The instruction to editor below adds mathematical description of the time domain waveform for secure HE-LTF, which uses the frequency domain windowing function w\_FD(k), as well as illustrates what a zero-power GI is.

**Instruction to TGaz Editor:**

Make the changes as shown in <https://mentor.ieee.org/802.11/dcn/21/11-21-1155-03-00az-lb253-misc-comments-part-2.docx> for CID 5475.

**Proposed Text Updates: CID 5475**

27.3.18a.4 Construction of Secure HE-LTF

*Instruction to TGaz Editor: Change TGaz D3.1 P242L32 as shown below:*

d) A frequency domain windowing function  is applied to all the tones of the secure HE-LTF sequence. When the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 0, the Rectangular window is used, where = 1 for all the tones in all channel bandwidths. When the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 1, the flat top window is used; it is defined as:

e) :

 (27-126d)

where



a0 = 0.21557895,

a1 = -0.41663158,

a2 = 0.277263158,

a3 = -0.083578947,

a4 = 0.006947368 and

NWinFT = 20.

Note that the  shall be normalized to have unit RMS power.

In Equations (27-126d) and (27-126e), the LTF subcarrier values , where  is secure LTF sequence constructed after step c).

f) There is no CSD per space-time stream.

g) There is no spatial mapping, the Q matrix is a block identity matrix.

h) IDFT: Compute the inverse discrete Fourier transform.

i) Insert zero-power GI and apply windowing: Prepend values of zero of length indicated by the TXVECTOR parameter GI\_TYPE and apply windowing as described in 27.3.10 (Mathematical description of signals).

j) 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. See 27.3.18a.6.

*Instruction to TGaz Editor: Insert the following text at TGaz D3.1 P242 between L17 and L18:*

27.3.18a.6 Modulation of Secure HE-LTF

Time domain representation of the HE-LTF field using the secure HE-LTF transmitted on frequency segment *iSeg* and transmit chain *iTX* is specified in Equation (27-x1).

(27-x1)

where

*THE-LTF-2X*, *THE-LTF-SYM*, *TGI2,Data*, Δ*F*,HE are defined in Table 27-12

 is the set of subcarriers with indices -*NSR* to *NSR* excluding DC subcarriers, where *NSR* is defined in Table 27-13

 is defined in 27.3.10

 is the number of users (specified in the TXVECTOR parameter NUM\_USERS)

 is the number of space-time streams for user *u* (specified in the TXVECTOR parameter NUM\_STS)

 is the number of number of repetitions of the HE-LTF symbols for user *u* (specified in the TXVECTOR parameter LTF\_REP)

 is the number of HE-LTF symbols per LTF repetition, and is obtained using Table 21-13 with *NSTS,total* and *NVHT-LTF* replaced by NSTS,u and NHE-LTF,u, respectively

 is a time-domain windowing function of duration *THE-LTF-2X*. An example of  is given in 17.3.2.5

NOTE – *THE-LTF-2X* is the duration of a 2x HE-LTF OFDM symbol excluding GI. Hence, the GI duration of each secure HE-LTF has low power since  has low value during the GI duration.







 is the frequency domain window function specified in Equation (27-126d)

*Lk,u* is the 64-QAM constellation for the *k*-th subcarrier of user *u* generated using the randomized LTF sequence as described in 27.3.18a.3

 is the phase rotation applied to spatial stream *s* within repetition *r*, , given in Equation (27-126f) for user *u*

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