IEEE P802.11
Wireless LANs

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| TGah D1.0 LB200 Comment Resolutions on 24.5 Sections |
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Abstract: This document contains proposed resolutions for the following CIDs from TGah D1.0 Comment Collection XX:

***Clause 24.3.7:***

* 1316
* 1317
* 1605
* 1606
* 1607
* 1608
* 1737
* 1738
* 1739
* 1764
* 2075

##### CIDs for Clause 24.3.7

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CID | Commenter | Section | Page.Line | Comment | Proposed Change | Resolution |
| 1316 | Adrian Stephens | 24.3.7 | 279.32 | I don't like "n.a." In other places we have "N/A". And it's unnecessary too. | Delete all "n.a." in this table, or add "n.a." definition to table notes. | Revise – The notation “n.a.” is used in other places of document. Keeping for now to stay consistent. Instead, adding a note to end of table to explain meaning of “n.a.” in this context |
| 1317 | Adrian Stephens | 24.3.7 | 280.11 | Table notes row has got an empty box to left. | Merge empty box with table notes. | Accept |
| 1605 | Brian Hart | 24.3.7 | 278.48 | Fig 24-24 shows LTFN\_LTF but this is not a defined field. Only LTF2\_LTF~LTFN\_LTF is a field. LTFN\_LTF is only a symbol . Ditto the data symbol | Get the terminology straight by taking a look at fig 22-17 (especially the explosion of the VHT-LTF and Data fields into symbols). Search for "field" thruout clause 24 and verify that no other inconsistencies are present. Related, could replace the "subfield" language at the bottom of P278 with "symbol" language | Reject, see Figure 24-20 (>=2MHz short format), Figure 24-21 (>=2MHz long format), and Figure 24-22 (1MHz format) for naming of fields for S1G fields. “LTF2~LTFNLTF” denotes field LTF2 ***to*** field LTFN\_LTF. However, Table 24-3 that defines the S1G fields could be revised in future to clear up this possible naming confusion. |
| 1606 | Brian Hart | 24.3.7 | 279.48 | "LTF2-LTFNLTF" renamed to "LTF2-NLTF" | Correct name | Reject, same as CID 1605. Current text is consistent with prior defintions. Current equations in text refer to LTF fields by number (i.e. LTF2, LTF3, LTF4) and this definition allows for individual LTFs to be referenced as such.  |
| 1607 | Brian Hart | 24.3.7 | 278.6 | Figu 24-24 does not distinguish first data symbol from subseqent data symbols despite that they may have different GIs | Explode Data field to show | Revise, see edited text and newly drawn figure. However, 1st symbol of Data always getting a Long GI is indicated in text description of equation 24-2, and does not need to be reflected in Figure 24-24. Figure 24-24 is meant to illustrate the relative timing offsets of the START of fields. |
| 1608 | Brian Hart | 24.3.7 | 283.2 | 1,-1,1,-1,1,-1 ... doesn't provide much "spreading" - looks like a poor choice for PAPR | Give me a reference to simulation justification or revisit this odd choice | Reject. See document 11-13/0521r0, titled Phase Rotations for 1MHz DUP Mode for simulation methodology and data for choosing sequence with lowest PAPR. Also note that 16x1MHz duping sequence is actually [1 1 1 -1 1 1 1 -1 -1 -1 1 -1 1 1 -1 1]. |
| 1737 | David Hunter | 24.3.7 | 279.10 | "equal to 2MHz long format": but 2MHz of what? Also the "in the case of" is unnecessary. | Replace "In the case of greater than equal to 2MHz format" with "When the format uses greater than or equal to 2 MHz bandwidth," | Revised, see text re-wording below |
| 1738 | David Hunter | 24.3.7 | 279.39 | "in the case of" is unclear -- does this apply to the whole preceding description or just the 3rd and 4th symbols? | Replace "symbols, and TGI for" with "symbols. For 1MHz bandwidth the duration is TGI for", replace "symbols in the" with "symbols." and delete the rest of the description. | Revised, see text re-wording below |
| 1739 | David Hunter | 24.3.7 | 280.31 | "in the case of" is unclear -- does this apply to the whole preceding description or last item (LTF2~LTFN...)? And what in the world does "and or for the T-LTFs in the case of" mean? | Replace this long complex description with a series of indented subparagraphs that clearly specify the conditions (without the vague "in the case of" modifiers) for each of the possible settings. | Revised, see text re-wording below |
| 1764 | Eugene Baik | 24.3.7 | 279.34 | Value for tone scaling factor for LTF1, under 4MHz column, should be 114, not 112 as written. This value should match with the number of populated tones (114 in the case of 4MHz) | Change entry in table for LTF1, 4MHz to 114 | Accept |
| 2075 | Jens Tingleff | 24.3.7 | 278.5 | (Figure 24-4) How many LTF fields are there in greater than or equal to 2 MHz short format? Since short format is SU only, we always have N\_LTF = 1 (according to table 24-10). But the drawing shows LTF2 ... . The drawings 22-15 and 20-1 crucially do not number the second lot of LTF symbols from 2 the way clause 24 does. Suggest making one more drawing where short format is drawn specifically. The numbering issue looks like it's repeated in Figure 24-36 and clause 24.4.3 | Suggest making one more drawing where short format is drawn specifically | Reject. The number of LTF fields (N\_LTF) is equal to the number of space-time streams used (Nsts). The 2MHz Short format will have more than 1 LTF field when SU MIMO is used (i.e. Nss > 1) or when STBC is used (Nsts > 1). Other comments regarding formatting of figures are handled with CIDs 1605, 1606, 1607.  |

*TGah Editor: Please make the following changes to the Section 24.3.7 text, changes below highlighted in yellow. Also please pay attention to ~~old text striked out in red~~, and also red text as special notes to editor:*

* Mathematical description of signals

For a description of the conventions used for the mathematical description of the signals, see 18.3.2.5 (Mathematical conventions in the signal descriptions).

For a 1 MHz S1G PPDU transmission, the 1 MHz is divided into 32 subcarriers. The signal is transmitted on subcarriers -13 to -1 and 1 to 13, with 0 being the center (DC) subcarrier.

For a 2 MHz S1G PPDU transmission, the 2 MHz is divided into 64 subcarriers. The signal is transmitted on subcarriers -28 to -1 and 1 to 28, with 0 being the center (DC) subcarrier.

For a 4 MHz S1G PPDU transmission, the 4 MHz is divided into 128 subcarriers. The signal is transmitted on subcarriers -58 to -2 and 2 to 58.

For an 8 MHz S1G PPDU transmission, the 8 MHz is divided into 256 subcarriers. The signal is transmitted on subcarriers -122 to -2 and 2 to 122.

For a 16 MHz S1G PPDU transmission, the 16 MHz is divided into 512 subcarriers. The signal is transmitted on subcarriers -250 to -130, -126 to -6, 6 to 126, and 130 to 250.

The transmitted signal is described in complex baseband signal notation. The actual transmitted signal is related to the complex baseband signal by the relation shown in Equation (24-1).

* 

where

 represents the real part of a complex variable;

 represents the center frequency of the carrier.

The transmitted RF signal is derived by up-converting the complex baseband signal, which consists of several fields. The timing boundaries for the various fields of the different frame formats are shown in Figure 24-24 (Timing boundaries for S1G PPDU fields) ~~where~~ *~~N~~~~LTF~~* ~~is the number of LTF or D-LTF symbols and is defined in Table 24-10 (Number of LTFs required for different numbers of space time streams), up to .~~ , where *NLTF* is the number of LTF or D-LTF symbols and is defined in Table 24-10 (Number of LTFs required for different numbers of space time streams), for up to .

(Note to editor: Replace original Figure 24-24 with new figure below):

|  |
| --- |
| * Timing boundaries for S1G PPDU fields
 |

The time offset, , determines the starting time of the corresponding field.

~~For 1MHz PPDU format, and greater than or equal to 2MHz short PPDU format, the signal transmitted on transmit chain i~~~~TX~~ ~~shall be as shown in Equation (24-2)~~

* ~~~~

~~Where~~

 ~~~~

(Note to editor: Replace original Equation 24-2 and text above with new equation below. Also note a new Equation 24-3 that will change equation numbering afterwards):

For the 1MHz PPDU frame format and the >= 2MHz Short PPDU frame format, the signal transmitted on transmitted on transmit chain *iTX* shall be as shown in Equation (24-2)

 (24-2)

Where

For the >= 2MHz Long PPDU format, the signal transmitted on transmit chain shall be as shown in Equation (24-3)

 (24-3)

Where

Each field,  , is defined as the summation of one or more subfields, where each subfield is defined to be an inverse discrete Fourier transform as specified in Equation (24-3).

(Note to editor: references to Equation 24-3 will change to Equation 24-4. Same holds for all future equations, hopefully taken care of and updated automatically if hyperlinks were set correctly in .rtf document editor)

* 

This general representation holds for all subfields. ~~In the case of greater than or equal to 2MHz long format~~ When the bandwidth is greater than or equal to 2MHz and the long format is used, the total power of the time domain ~~S1G modulated~~ Data-portion field signals summed over all transmit chains should not exceed the total power of the time domain Omni-portion signals summed over all transmit chains. For notational simplicity, the parameter BW is omitted from some bandwidth dependent terms.

Table 24-7 (Tone scaling factor and guard interval duration values for PHY fields) summarizes the various values of  as a function of bandwidth per frequency segment.

|  |
| --- |
| * Tone scaling factor and guard interval duration values for PHY fields (continued)
 |
| Field |  as a function of bandwidth per frequency segment | Guard interval duration |
| 1 MHz | 2 MHz | 4 MHz | 8 MHz | 16 MHz |
| STF | 6 | 12 | 24 | 48 | 96 | n.a.(See NOTE 2) |
| LTF1 | 26 | 56 | ~~112~~114 | 242 | 484 | *~~T~~~~GI2~~* ~~for the first 2 symbols, and~~ *~~T~~~~GI~~* ~~for the 3~~~~rd~~ ~~and 4~~~~th~~ ~~symbols in the case of 1MHz~~For bandwidths >=2MHz, duration is *TGI2*.For 1MHz bandwidth, duration is *TGI2* for 1st and 2nd symbols, and *TGI* for 3rd and 4th symbols. |
| SIG | 26 | 52 | 104 | 208 | 416 | *TGI* |
| SIG-A for long format | n.a. | 52 | 104 | 208 | 416 | *TGI* |
| D-STF for long format | n.a. | 12 | 24 | 48 | 96 | n.a. |
| LTF2~*NLTF* | 26 | 56 | 114 | 242 | 484 | *TGI* |
| D-LTF for long format | n.a. | 56 | 114 | 242 | 484 | *TGI* |
| SIG-B for long format | n.a. | 56 | 114 | 242 | 484 | *TGI* |
| 1st Data Symbol | 26 | 56 | 114 | 242 | 484 | *TGI*(See NOTE ~~2~~ 3) |
| From 2nd to the last Data Symbols | 26 | 56 | 114 | 242 | 484 | *TGI* or *TGIS* (see NOTE ~~2~~ 3) |
| 1MHz\_DUP\_OFDM-Data(see NOTE 1) | n.a. | 52 | 104 | 208 | 416 | *TGI* or *TGIS* (see NOTE ~~2~~ 3) |
| 2MHz\_DUP\_OFDM-Data(see NOTE 1) | n.a. | n.a. | 112 | 224 | 448 | *TGI* or *TGIS* (see NOTE ~~2~~ 3) |
| ~~(Delete this box)~~ | ~~NOTE 1—For notational convenience, 1MHz\_HT\_DUP\_OFDM-Data and 2MHz\_HT\_DUP\_OFDM-Data is used as a label for the Data field of a duplicated PPDU with format type 1MHz\_DUP\_OFDM or 2MHz\_DUP-OFDM.~~~~NOTE2—~~*~~T~~~~GI~~* ~~denotes guard interval duration when TXVECTOR parameter GI\_TYPE equals LONG\_GI,~~ *~~T~~~~GIS~~* ~~denotes short guard interval duration when TXVECTOR parameter GI\_TYPE equals SHORT\_GI. Regardless of the GI\_TYPE value in TXVECTOR, the 1~~~~st~~ ~~Data OFDM symbol always uses~~ *~~T~~~~GI~~* ~~as its guard interval duration.~~ |
| NOTE 1—For notational convenience, 1MHz\_HT\_DUP\_OFDM-Data and 2MHz\_HT\_DUP\_OFDM-Data is used as a label for the Data field of a duplicated PPDU with format type 1MHz\_DUP\_OFDM or 2MHz\_DUP-OFDM.NOTE 2—The OFDM symbols of the STF do not have a guard interval, therefore its duration is not applicable. NOTE3—*TGI* denotes guard interval duration when TXVECTOR parameter GI\_TYPE equals LONG\_GI, *TGIS* denotes short guard interval duration when TXVECTOR parameter GI\_TYPE equals SHORT\_GI. Regardless of the GI\_TYPE value in TXVECTOR, the 1st Data OFDM symbol always uses *TGI* as its guard interval duration. |

 for the Omni portion of the greater than or equal to 2MHz long format, , for all other cases, , where  is given in Table 24-6 (Frequently used parameters).

is a windowing function. An example function, , is given in 18.3.2.5 (Mathematical conventions in the signal descriptions).

~~is~~ *~~T~~~~STF~~* ~~for STF,~~ *~~T~~~~LTF1~~* ~~for LTF1,~~ *~~T~~~~SIG~~* ~~for SIG,~~ *~~T~~~~SIG-A~~* ~~for SIG-A,~~ *~~T~~~~D-STF~~* ~~for D-STF,~~ *~~T~~~~LTF~~* ~~for LTF2~LTFNLTF in the case of 1MHz format and greater than or equal to 2MHz short format and or for the D-LTFs in the case of greater than or equal to 2MHz long format, and~~ *~~T~~~~SIG-B~~* ~~for SIG-B.  is~~ *~~T~~~~SYM~~* ~~for Data symbols, that is~~ *~~T~~~~SYML~~* ~~when not using the short guard interval (Short GI field of SIG or SIG-A is 0), or the first Data symbol regardless of the Short GI field in SIG or SIG-A field, and~~ *~~T~~~~SYMS~~* ~~from the 2~~~~nd~~ ~~to the last Data symbols when using the short guard interval (Short GI field of SIG or SIG-A is 1).~~

 ~~is defined in Table 24-6 (Frequently used parameters).~~

is time duration of the subfield being referenced, and its usage is as follows:

* *TSTF* for the STF, *TD-STF* for the D-STF
* *TLTF1* for the LTF1
* *TSIG* for SIG, *TSIG-A* for SIG-A,
* *TLTF* for LTF2~LTFNLTF for the 1MHz format, the >= 2MHz short format, and for the D-LTFs in the >= 2MHz long format
* *TSIG-B* for SIG-B.

is defined in Table 24-6 (Frequently used parameters).

 is the highest data subcarrier index per frequency segment and has values listed in Table 24-4 (Timing-related constants) and in Table 24-5 (Timing-related constants for SIG/SIG-A field in 2MHz PPDUs).

is defined in Table 24-6 (Frequently used parameters).

is defined in Table 24-6 (Frequently used parameters).

 indicates the element in row *a* and column *b* of the matrix *X*, where , and .  and  are the number of rows and columns, respectively, of the matrix *X*.

is the spatial mapping matrix for the subcarrier *k*. For the Omni-portion of greater than or equal to 2MHz long format, is a column vector, denoted as , with  elements with element  being  , where  represents the cyclic shift for transmitter chain  whose values are given in Table 24-12 (Per antenna cyclic shift values of S1G long preamble PPDU). For other cases, is a matrix with  rows and  columns.

is the subcarrier frequency spacing given in Table 24-4 (Timing-related constants).

is the frequency-domain symbol in subcarrier *k* of user *u* for of space-time stream *m*. Some of the  within have a value of zero. Examples of such cases include the DC tones, guard tones on each side of the transmit spectrum, as well as the unmodulated tones of STF and D-STF fields.

is the guard interval duration used for each OFDM symbol in the field. The value for each field is as defined in Table 24-7 (Tone scaling factor and guard interval duration values for PHY fields). ,  and  are defined in Table 24-4 (Timing-related constants).

, for the Omni-portion of greater than or equal to 2MHz long format, . For the other cases,  represents the cyclic shift per space-time stream, whose value is defined in Table 24-9 (Cyclic shift values for the S1G short preamble PPDU) for ≥2MHz, and Table 24-17 (Cyclic shift values of S1G 1MHz PPDU).

The function  is used to represent a rotation of the tones. BW in  is determined by the TXVECTOR parameter CH\_BANDWIDTH as defined in Table 24-8.

|  |
| --- |
| * CH\_BANDWIDTH and *k,*BW
 |
| CH\_BANDWIDTH | *k,*BW |
| CBW1 |  |
| CBW2 |  |
| CBW4 |  |
| CBW8 |  |
| CBW16 |  |

For a 1 MHz PPDU transmission,

* 

For a 2 MHz PPDU transmission,

* 

For a 4 MHz PPDU transmission,

* 

For an 8 MHz PPDU transmission,

* 

For a 16 MHz PPDU transmission,

* 

For a 2MHz transmission using 1MHz duplicated mode,

*

For a 4MHz transmission using 1MHz duplicated mode,

*

For a 8MHz transmission using 1MHz duplicated mode,

*

For a 16MHz transmission using 1MHz duplicated mode,

*

