IEEE P802.11
Wireless LANs

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| Comment Resolution for Section 32.3.7 (Mathematical description of signals) and related Sections |
| Date: 2021-01-04 |
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Abstract

This submission proposes resolutions for comments received on Section 32.3.7 (Mathematical description of signals) and related Sections in TGbd D1.0. The following is the list of 16 CIDs:

* 1501, 1502, 1503, 1536, 1537, 1657, 1658, 1694, 1765, 1770, 1771, 1811, 1812, 1813, 1815, 1816

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 1536 | 32.3.6 | 58.12 | There is only one frequency segment in NGV PPDU. Remove "per frequency segment" in all related entries in Table 32-6. | Change "Number of data subcarriers per frequency segment" to "Number of data subcarriers"; change "Number of pilot subcarriers per frequency segment" to "Number of pilot subcarriers"; change "Total number of subcarriers per frequency segment" to "Total number of subcarriers"; change "Highest data subcarrier index per frequency segment" to "Highest data subcarrier index". | Agreed.Please see the changes in 11-21/0016r0. |
| 1765 | 32.3.6 | 58.26 | If the task group insists on keeping CBW20, at least define it so that it can be used in unlicensed spectrum. Change the PPDU for CBW20 so that it uses a 3.2us DFT period. | Change the CBW20 so that it is fully interoperable with VHT20, and has the ability to defer based on L-SIG (like VHT20). Alternatively, remove CBW20 | Rejected.The definition of NGV 20 MHz PPDU is intended for usage in licensed ITS bands, and there is no requirement for interoperability with unlicensed WiFI PPDU, like VHT20. The 20 MHz PPDU for vehicular communications using unlicensed bands is a separate format, which is not defined in 11bd yet.  |
| 1811 | 32.3.6 | 58.52 | typo in T\_NGV-LTF raw in the table | or between T\_NGV-LTF-2X or T\_NGV-LTF-1X should be deleted | Agreed.Please see the changes in 11-21/0016r0. |
| 1537 | 32.3.7.2 | 59.42 | The description in the reference to subcluase 19 only describes 20MHz, and the wording in the corresponding subcluase 17 is not compatible. Suggests to rewrite the tone indices here and refer to subcluase 17.3.2.6. | Change "For description on subcarrier indices over which the signal is transmitted for non-NGV10 MHz PPDUs, see 19.3.7 (Mathematical description of signals)" to "For a 10 MHz non-NGV PPDU, the signal is transmitted on subcarriers -26 to -1 and 1 to 26, with 0 being the center (DC) subcarrier. See17.3.2.6 (Discrete time implementation considerations)" | Agreed.Please see the changes in 11-21/0016r0. |
| 1812 | 32.3.7.2 | 59.42 | no definition of non-NGV 10 MHz PPDU | it should be 10 MHz non-NGV PPDU | Agreed.Please see the changes in 11-21/0016r0. |
| 1501 | 32.3.7.3 | 60.5 | The 802.11ax D8.0 draft explicitly indicates that the timing boundaries and mathematical description apply to PPDUs without midambles (see page 569 L6 of 802.11ax D8.0). I suggest to proceed similarly in Section 32.3.7.3. | Replace the text "The timing boundaries for the various fields are shown in Figure 32-9" by "The timing boundaries for the various fields when the midamble is not present are shown in Figure 32-9" (note: proposed text is a slight modification of the text in p. 569 L6 of 802.11ax D8.0) | Rejected.In 802.11ax, Midamble is an optional feature, and it make senses to construct timing boundaries without Midamble as a typical case. In 802.11bd, Midamble is mandatory for NGV PPDU, so it is more appropriate to include Midamble in the figure. |
| 1657 | 32.3.7.3 | 60.12 | The Non-NGV portion arrow in Fig 32-9 starts at the beginning of L-STF and ends after RL-SIG and before NGV-SIG. In 11.ax D7.0 Fig. 27.23 the Non-HE portion ends after L-SIG and before RL-SIG. Since the "legacy" preamble ends after L-SIG and before RL-SIG, the Non-NGV portion arrow should end after L-SIG and before RL-SIG and the NGV portion arrow should start after L-SIG and with RL-SIG. | As in comment | Agreed.Please see the changes in 11-21/0016r0. |
| 1770 | 32.3.7.3 | 60.12 | Non-NGV portion should not include RLSIG | Please put RLSIG in the NGV portion | Agreed.Refer the resolution to CID1657.  |
| 1813 | 32.3.7.3 | 60.12 | non-NGV portion does not include RL-SIG | fix the range of non-NGV portion up to L-SIG | Agreed.Refer the resolution to CID1657. |
| 1815 | 32.3.7.3 | 60.18 | In Figure 32-9, N\_NGV-LTF and N\_sym are missing | N\_NGV-LTF and N\_sym should be added below NGV-LTF symbols and data symbols, respectively in Figure 32-9 | Revsied.Add the indication of N\_NGV-LTF and N\_sym. In addition, modify the figure to better reflect the number of symbols in Midamble.Please see the changes in 11-21/0016r0. |
| 1502 | 32.3.7.3 | 60.25 | The 802.11ax D8.0 draft explicitly indicates that the timing boundaries and mathematical description apply to PPDUs without midambles (see page 569 L24 of 802.11ax D8.0). I suggest to proceed similarly in Section 32.3.7.3. | Replace the caption of Figure 32-9 to "Timing boundaries for NGV PPDU fields if midamble is not present" (Note: see caption in page 569 L24 of 802.11ax D8.0). | Rejected.Similar comment as CID 1501. Please refer the resolution to CID1501. |
| 1694 | 32.3.7.3 | 60.27 | The parameter "tField" only appears once in the draft and does not appear to be used for anything. | Either delete "tField" (t<subscript>Field) from the sentence or define its use. | Rejected.“tField” is the general expression of the start time of each “Field”. It is clear in the sentence following the term. The same expression is also used in 802.11REVmd and 802.11ax D8.0.   |
| 1503 | 32.3.7.3 | 60.31 | The 802.11ax D8.0 draft explicitly indicates that the timing boundaries and mathematical description apply to PPDUs without midambles (see page 569 L32 of 802.11ax D8.0). I suggest to proceed similarly in Section 32.3.7.3. | Replace the text "The signal transmitted on transmit chain i\_TX shall be as shown in Equation (32-2)" by "The signal transmitted on transmit chain i\_TX shall be as shown in Equation (32-2) if midamble is not present." (Note: see page 569 L32 of 802.11ax D8.0) | Rejected.Similar comment as CID 1501. Please refer the resolution to CID1501. |
| 1658 | 32.3.7.3 | 61.28 | RL-SIG is ommited in the TSubfield list for the windowing function | Add after L-SIG, "TRL-SIG for RL-SIG" | Revised.Made the changes for RL-SIG, Midamble and Data. Please see the changes in 11-21/0016r0. |
| 1771 | 32.3.7.3 | 61.39 | Q\_k is a matrix with NTX rows and NSTS columns. Parameter NSTS is not defined in Table 32-7 (Frequently used parameters). | Please define NSTS. | Revised.In 11bd, there is no STBC, need to use NSS instead of NSTS, which is defined in Table 32-7 (Frequently used parameters). Please see the changes in 11-21/0016r0. |
| 1816 | 32.3.7.3 | 61.64 | N\_sts,total is not defiend. Given no STBC supported, it should be N\_ss,total. | add the definition of N\_ss,total in the table of "Frequently used parameters" | Revised.The terminology of N\_sts,total is used to Section 21.3.8.3.2. It is used to describe the corresponding rows in the table for Nss=1 and 2 for 11bd. Modify the text to clarify. Please see the changes in 11-21/0016r0. |

*TGbd Editor: Please make the following changes in Table 32-6 in Section 32.3.6 of D1.0.*

32.3.6 Timing related parameters

Table 32-6 (Timing-related constants) defines the timing-related parameters.

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| Table 32-6 Timing-related constants  |
| Parameter | CBW10 | CBW20 | Description |
| *NSD* | 52 | 108 | Number of data subcarriers (#1536) |
| *NSP* | 4 | 6 | Number of pilot subcarriers (#1536) |
| *NST* | 56 | 114 | Total number of subcarriers (#1536)See NOTE. |
| *NSR* | 28 | 58 | Highest data subcarrier index (#1536) |
| *∆F* | 156.25 kHz | Subcarrier frequency spacing |
| *TDFT* | 6.4 µs | IDFT/DFT period |
| *TGI* | 1.6 µs = *TDFT* /4 | Guard interval duration |
| *TGI2* | 3.2 µs | Double guard interval |
| *TSYM* | 8 µs = *TDFT* + *TGI =* 1.25 *TDFT*  | Symbol interval |
| *TL-STF* | 16 µs = 10 x *TDFT* /4 | Non-HT Short Training field duration |
| *TL-LTF* | 16 µs = 2 x *TDFT* + *TGI2* | Non-HT Long Training field duration |
| *TL-SIG* | 8 µs | Non-HT SIGNAL field duration |
| *TRL-SIG* | 8 µs | Repeated Non-HT SIGNAL field duration |
| *TNGV-SIG* | 8 µs | NGV Signal field duration |
| *TRNGV-SIG* | 8 µs | Repeated NGV Signal field duration |
| *TNGV-STF* | 8 µs | NGV Short Training field duration |
| *TNGV-LTF-2X* | 8 µs | Duration of each NGV-LTF-2x symbol |
| *TNGV-LTF-1X* | 4.8 µs | Duration of each NGV-LTF-1x symbol |
| *TNGV-LTF-2X-Repeat* | 14.4 µs | Duration of each repeated NGV-LTF-2x symbol |
| *TNGV-LTF* | *T*NGV-LTF-2X, (#1811) *T*NGV-LTF-1X or *T*NGV-LTF-2X-Repeat depending upon the LTF format used | Duration of each OFDM symbol in NGV LTF field |
| *Nservice* | 16 | Number of bits in the SERVICE field |
| *Ntail* | 6 | Number of tail bits per BCC encoder |
| NOTE—*NST* = *NSD* + *NSP* |

*TGbd Editor: Please make the following changes in Section 32.3.7.2 of D1.0.*

* + 1. Mathematical description of signals

32.3.7.1 Notation

For a description of the conventions used for the mathematical description of the signals, see 17.3.2.5 (Mathematical conventions in the signal descriptions), and 21.3.7.1 (Notation).

32.3.7.2 Subcarrier indices in use

For a 10 MHz non-NGV PPDU (#1812), the signal is transmitted on subcarriers -26 to -1 and 1 to 26, with 0 being the center (DC) subcarrier. See 17.3.2.6 (Discrete time implementation considerations) (#1537)

For a 10 MHz NGV PPDU transmission, the 10 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 20 MHz NGV PPDU transmission, the 20 MHz is divided into 128 subcarriers. The signal is transmitted on subcarriers –58 to –2 and 2 to 58.

*TGbd Editor:Please replace Figure 32-9 (Timing boundaries for NGV PPDU fields) in P60 L25 in D1.0 with the following figure:*

(#1657, #1770, #1813, #1815)

*TGbd Editor:Please make the following changes in P61L25 in Section 32.3.7.3:*

 is a windowing function. An example function, , is given in 17.3.2.5 (Mathematical conventions in the signal descriptions). is *TL-STF* for L-STF, *TL-LTF* for L-LTF, *TL-SIG* for L-SIG, *TRL-SIG* for RL-SIG, *TNGV-SIG* for NGV-SIG, *TRNGV-SIG* for RNGV-SIG*, TNGV-STF* for NGV-STF and *TNGV-LTF* for NGV-LTF symbol and Midamble symbol, and *TSYM* for Data symbol. (#1658)

 is the spatial mapping matrix for the subcarrier *k*. For pre-NGV modulated fields, is a column vector with elements with element being , where represents the cyclic shift for transmitter chain whose values are given in Table 21-10 (Cyclic shift values for L-STF, L-LTF, L-SIG, and NGV-SIG fields of the PPDU). For NGV modulated fields, is a matrix with rows and columns. (#1771)

*TGbd Editor:Please make the following changes in P61L60 in Section 32.3.7.3:*

 For pre-NGV modulated fields, . For NGV modulated fields, represents the cyclic shift per spatial stream, whose value is given in 21.3.8.3.2 (Cyclic shift for VHT modulated fields), where the row for NSTS,*total* = 1 corresponds to NSS = 1 and the row for NSTS,*total* = 2 corresponds to NSS = 2, respectively. (#1816)