IEEE P802.11  
Wireless LANs

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| SB1 Clause 23 CID Resolutions | | | | |
| Date: 2016-03-14 | | | | |
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Abstract

This submission proposes resolutions for comments in Clause 23 of TGah Draft 6.0 with the following CIDs:

Clause 23 CIDs (22 total):

9015

9014

9016

9011

9021

9022

9024

9017

9019

9020

9009

9013

9018

9012

9023

9010

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9053

9054

9016

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGah Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGah Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGah Editor: Editing instructions preceded by “TGah Editor” are instructions to the TGah editor to modify existing material in the TGah draft. As a result of adopting the changes, the TGah editor will execute the instructions rather than copy them to the TGah Draft.***

## Comment Resolutions for Clause 23 CIDs

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Line** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 9015 | 393 | 3 | 23.2.2 | The text describing the MU\_SU field of TXVECTOR is listing mode combinations that do not exist, such as duplicate mode for S1G\_LONG. | The text describing the MU\_SU field of TXVECTOR is listing mode combinations that do not exist, such as duplicate mode for S1G\_LONG. | Revise.  Agree that we should clean up the whole entry and only describe modes where the MU\_SU field is relevant.  Instruction to Editor: Please apply changes under Changes for CID 9015 in <this document ID no.>. |
| 9014 | 404 | 17 | 23.2.2 | PSDU\_LENGTH in TXVECTOR should be supported as an MU field | PSDU\_LENGTH in TXVECTOR should be supported as an MU field | Revise.  Instruction to Editor: Change the Y to MU for the TXVECTOR column on the line for when "FORMAT is S1G” |
| 9011 | 438 | 57 | 23.3.8.2.1.1 | Provide clarification of how single stream fields such as STF, LTF, SIG(-B) are replicated up to N\_sts streams such that per-space-time-stream CSDs are applied to the entire S1G\_SHORT preamble or the beamchangeable portion of the S1G\_LONG preamble | Provide clarification of how single stream fields such as STF, LTF, SIG(-B) are replicated up to N\_sts streams such that per-space-time-stream CSDs are applied to the entire S1G\_SHORT preamble or the beamchangeable portion of the S1G\_LONG preamble | Revise.  The proposed changes detailed below provide more description text to satisfy comment.  Instruction to Editor: Please apply changes under Changes for CID 9011, 9078, 9079 in <this document ID no.>. |
| 9021 | 438 | 52 | 23.3.8.2.1 | Description for intro S1G\_SHORT preamble can use a little more description/clarity | Description for intro S1G\_SHORT preamble can use a little more description/clarity | Revise.  Instruction to Editor:  Change subclause text to: "The S1G\_SHORT preamble is used for the S1G\_SHORT and S1G\_DUP\_2M PPDU formats and is only used for SU transmissions. The S1G\_SHORT preamble is structured similarly to the Greenfield format as defined in Clause 19." |
| 9022 | 438 | 47 | 23.3.8.2 | Title of section "Greater than or equal to 2MHz PPDU Format" for >=2MHz is misleading and does not correspond to any defined terms for PPDU formats | Title of section "Greater than or equal to 2MHz PPDU Format" for >=2MHz is misleading and does not correspond to any defined terms for PPDU formats | Revise:  Instruction to Editor:  Rename subclause title to "Formats for greater than or equal to 2MHz". Add description text under subclause heading: "This subclause describes the preamble formats used for non-duplicate S1G PPDUs of 2MHz and greater and duplicate S1G\_DUP\_2M PPDUs." |
| 9024 | 438 | 42 | 23.3.8.1 | The introduction section to S1G preambles should also mention which preamble formats correspond to which duplicate mode PPDU formats | The introduction section to S1G preambles should also mention which preamble formats correspond to which duplicate mode PPDU formats | Revise.  Instruction to Editor:  Replace subclause text with: "Three preamble formats are defined that correspond to the three non-duplicate S1G PPDU formats: the S1G\_1M preamble, the S1G\_SHORT preamble, and the S1G\_LONG preamble. The first two preamble formats are defined solely for single user, and the third preamble format may be used in either single user or multiuser PPDUs. The duplicate mode PPDU formats S1G\_DUP\_2M and S1G\_DUP\_1M use the S1G\_SHORT and S1G\_1M preambles, respectively." |
| 9017 | 447 | 42 | 23.3.8.2.2.1.1 | The sentence "Omnidirectional portion of the S1G\_LONG preamble is single user modulated" should be rewritten to sound better grammatically and to clarify that it is also single-space-time stream. | The sentence "Omnidirectional portion of the S1G\_LONG preamble is single user modulated" should be rewritten to sound better grammatically and to clarify that it is also single-space-time stream. | Revise.  Instruction to Editor: Change sentence to: "The Omnidirectional portion of the S1G\_LONG preamble is single-user and single-space-time stream modulated. By definition, to be omnidirectional, no spatial mapping (*Q-*matrix multiplication) is applied." |
| 9019 | 447 | 30 | 23.3.8.2.2 | The description for the introduction to S1G\_LONG preambles can use a little more description/clarity | The description for the introduction to S1G\_LONG preambles can use a little more description/clarity | Revise.  Instruction to Editor: Change first paragraph of subclause to: "The S1G\_LONG preamble is used for the S1G\_LONG PPDU format. In contrast to the S1G\_1M and S1G\_SHORT preambles, the S1G\_LONG preamble can be used for MU transmissions, in addition to SU transmissions. The S1G\_LONG preamble is structured similarly to the Mixed mode format as defined in Clauses 19 and 21." |
| 9020 | 447 | 47 | 23.3.8.2.2.1.2 | The description for cyclic shifts for the S1G\_LONG portion should be split for the Omnidirectional portion and Beamchangeable portion | The description for cyclic shifts for the S1G\_LONG portion should be split for the Omnidirectional portion and Beamchangeable portion | Revise.  Agree to split the existing text by moving the per-space-time-stream Beamchangeable cyclic shifts to 23.3.8.2.2.2.2  Instruction to Editor: Please apply changes under Changes for CID 9020 in <this document ID no.>. |
| 9009 | 452 | 41 | 23.3.8.2.2.1.5 | For SIG-A, when the Coding field is set to 0, the LDPC Extra field should be set to a Reserved value of 1, to stay consistent with the field definitions of SIG, and of SIG-A in the previous drafts. | For SIG-A, when the Coding field is set to 0, the LDPC Extra field should be set to a Reserved value of 1, to stay consistent with the field definitions of SIG, and of SIG-A in the previous drafts. | Revise.  The SIG-A’s coding field should match that of the SIG field, such that when Coding is 0, the LDPC Extra is set to a reserved value of 1.  Instruction to Editor: Change the description box text to read: “If Coding field is 1, set to 1 if the LDPC PPDU encoding process (of an SU PPDU), results in an extra OFDM symbol (or symbols) as described in 21.3.10.5.4 (LDPC coding), otherwise set to 0.  If Coding field is 0, this field is set to 1” |
| 9013 | 455 | 11 | 23.3.8.2.2.1.5 | For the MU SIG-A, the Length field should be set to Nsym since A-MPDU is always used. | For the MU SIG-A, the Length field should be set to Nsym since A-MPDU is always used. | Revise.  Agree that it should be set to the value of Nsym, not PSDU\_LENGTH.  Instruction to Editor: Change text of description box to read: “Set to N\_sym, given in Section 23.4.3 (TXTIME and PSDU\_LENGTH calculation).  NOTE— A-MPDU is always used for MU PPDUs.” |
| 9018 | 456 | 61 | 23.3.8.2.2.2 | The sentence "Beamchangeable portion of the long preamble could be either single user or multiuser modulated" should be rewritten for more clarity/detail and correct grammar. | The sentence "Beamchangeable portion of the long preamble could be either single user or multiuser modulated" should be rewritten for more clarity/detail and correct grammar. | Revise.  Instruction to Editor: Change sentence to "The Beamchangeable portion of the S1G\_LONG preamble can be either single-user or multiuser modulated with single or multiple space-time-streams. Beamforming can be applied through spatial mapping (Q-matrix multiplication) starting with the Beamchangeable portion of the preamble and continuing into the Data field." |
| 9012 | 462 | 41 | 23.3.8.3.1 | Provide clarification of how single stream fields such as STF, LTF, SIG are replicated up to N\_sts streams such that per-space-time-stream CSDs are applied to the entire S1G\_1M preamble | Provide clarification of how single stream fields such as STF, LTF, SIG are replicated up to N\_sts streams such that per-space-time-stream CSDs are applied to the entire S1G\_1M preamble | Revise.  The proposed changes detailed below provide more description text to satisfy comment.  Instruction to Editor: Please apply changes under Changes for CID 9012, 9081, 9082 in <this document ID no.>. |
| 9023 | 462 | 36 | 23.3.8.3 | Title of section for 1MHz is misleading and does not correspond to any defined terms for PPDU formats | Title of section for 1MHz is misleading and does not correspond to any defined terms for PPDU formats | Revise.  Instruction to Editor:  Rename subclause heading "Format for 1MHz". Add description text under subclause heading: "This subclause describes the preamble format used for non-duplicate S1G PPDUs of 1MHz and duplicate S1G\_DUP\_1M PPDUs." |
| 9010 | 466 | 30 | 23.3.8.3.4 | For the 1MHz SIG, when the Coding field is set to 0, the LDPC Extra field should be set to a Reserved value of 1, to stay consistent with the field definitions of SIG, and of the 1MHz SIG in previous drafts. | For the 1MHz SIG, when the Coding field is set to 0, the LDPC Extra field should be set to a Reserved value of 1, to stay consistent with the field definitions of SIG, and of the 1MHz SIG in previous drafts. | Revise.  The 1MHz SIG’s coding field should match that of the SIG field, such that when Coding is 0, the LDPC Extra is set to a value of 1.  Instruction to Editor: Change the description box text to read: “If Coding field is 1, set to 1 if the LDPC PPDU encoding process (of an SU PPDU), results in an extra OFDM symbol (or symbols) as described in 21.3.10.5.4 (LDPC coding), otherwise set to 0.  If Coding field is 0, this field is set to 1” |
| 9078 | 418 | 1 | 23.3.4.3.1 | CID 8516 "With S1G\_SHORT, CSD is applied for each space-time stream. For STF, which is always considered as single stream, it means no CSD is mandated even though multiple transmit chains may be available. This may create unintended BF, and no CSD gain for non-BF SISO transmission." was on STF. It was rejected while the resolution was referring to descriptions of generation of LTF fields for clarifications. It would be more clear to include more clarifications on the generation of STF in this section to avoid confustion. | Add more clarifications in this section | Revise.  Agree with commenter to add clarification that CSDs are applied per-space-time-stream to the STF, after field is replicated up to N\_STS,total streams.  Instruction to editor: Make changes in <this document ID no.> under Changes for CID 9011, 9078, 9079. |
| 9079 | 419 | 9 | 23.3.4.3.3 | CID 8460 is on SIG and was "In Step g), CSD is applied for each space-time stream. For S1G\_SHORT preamble, no CSD is mandated for the SIG field, which is always considered as single stream,even though multiple transmit chains may be available. This may create unintended BF, and no CSD gain for non-BF SISO transmission." And it was rejected while the resolution refers to LTF section.It It would be more clear to include more clarifications on the generation of STF in this section to avoid confustion. | Add more clarifications in this section | Revise.  Agree with commenter to add clarification that CSDs are applied per-space-time-stream to the SIG, after field is replicated up to N\_STS,total streams.  Instruction to editor: Make changes in <this document ID no.> under Changes for CID 9011, 9078, 9079. |
| 9080 | 420 | 21 | 23.3.4.4.1 | CID 8461 was on STF and was "With S1G\_1M PPDU, CSD is applied for each space-time stream. For STF, which is always considered as single stream, it means no CSD is mandated even though multiple transmit chains may be available. This may create unintended BF, and no CSD gain for non-BF SISO transmission." It was rejected with clarification referring to LTF section while this CID is on STF. It would be more clear to include more clarification in this section to avoid confusion. | Add more clarifications in this section | Revise.  Agree with commenter to add clarification that CSDs are applied per-space-time-stream to the STF after field is replicated up to N\_STS,total streams.  Instruction to editor: Make changes in <this document ID no.> under Changes for CID 9012, 9080, 9081. |
| 9081 | 421 | 26 | 23.3.4.4.3 | CID 8462 was on SIG and was "With S1G\_1M PPDU, CSD is applied for each space-time stream. For SIG field, which is always considered as single stream, it means no CSD is mandated even though multiple transmit chains may be available. This may create unintended BF, and no CSD gain for non-BF SISO transmission." This CID was on SIG but was rejected while the resolution refers to clarifications in the LTF section. It would be more clear to include more clarification in this section to avoid confusion. | Add more clarifications in this section | Revise.  Agree with commenter to add clarification that CSDs are applied per-space-time-stream to the SIG, after field is replicated up to N\_STS,total streams.  Instruction to editor: Make the changes in <this document ID no.> under Changes for CID 9012, 9080, 9081. |
| 9053 | 485 | 60 | 23.3.16.1 | The resolution to comment i-546 does not address the comment. The comment states "RF LO" is undefined. The resolution suggests that the "RF LO" "should already be defined elsewhere" is neither a precise explanation, nor a valid reason for not defining the term. Either the term is already defined in the standard, or it is not defined in the standard and needs to be defined. . | If the acronym RF LO is defined in the base standard, state in the resolution to THIS comment that the term RF LO is already defined in the base standard. If the term is NOT defined in the base standard, add a definition in the appropriate definitions clause. | Revise.  Agree to define RF LO as the RF’s local oscillator.  Instruction to Editor: Make changes under section titled Changes for CID 9053, 9054 in <this document ID no.>. |
| 9054 | 485 | 60 | 23.3.16.1 | RF LO is not defined in this amendment and the meaning is not obvious from the context. Without knowledge of what "the RF LO" is referring to, technical review of the clause, and thus the amendment, is not possible. | Provide a cross reference to where "the RF LO" is defined in the standard. | Revise.  Agree to define RF LO as the RF’s local oscillator.  Instruction to Editor: Make changes in the section titled Changes for CID 9053, 9054 in <this document ID no.>. |
| 9016 | 404 | 4 | 23.2.2 | The max length for APEP\_LENGTH of TXVECTOR is not realizable in S1G, it may be better to revise the description of range or omit it entirely. | The max length for APEP\_LENGTH of TXVECTOR is not realizable in S1G, it may be better to revise the description of range or omit it entirely. | Revise.  Agree to omit mention of range as this is not an essential part of its description in TXVECTOR  Instruction to Editor: Make changes in the section titled Changes for CID 9016 in <this document ID no.>. |

## Changes for CID 9015

Instruction to Editor: Modify text on Page 393 starting at Line 3 in Section 23.2.2 of TGah\_D6.0 and delete the empty boxes

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| --- | --- | --- | --- | --- |
| MU\_SU | FORMAT is S1G and  PREAMBLE\_TYPE is  S1G\_LONG\_PREAMBLE  and CH\_BANDWIDTH is  CBW2 or CBW4 or CBW8 or  CBW16 | Determine whether MU or SU of the S1G PPDU  Enumerated type:  Set to MU if NUM\_USERS is 2 to 4.  Set to SU if NUM\_USERS is 1. | Y | Y |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Otherwise | Not present | | |

## Changes for CID 9011, 9078, 9079

Instruction to Editor: Modify text on Page 438 starting at Line 58 in Section 23.3.8.2.1.1 of TGah\_D6.0

### 23.3.8.2.1.1 Cyclic shift for S1G modulated fields

The cyclic shift values defined in this subclause apply to the STF, LTF, SIG and Data fields of the S1G\_SHORT preamble PPDU, for ≥ 2 MHz Tx bandwidths. Throughout the S1G\_SHORT preamble, cyclic shifts are applied to prevent beamforming when similar signals are transmitted in different space-time streams. The STF, LTF, and SIG fields start as single-stream during generation but are replicated up to streams. For the LTF, these replicated streams undergo P-matrix mapping prior to CSD application as shown in Figure 23-6 (Generation of LTF symbols). For the STF and SIG the CSDs are applied per stream immediately after replication.The same cyclic shift is applied to the streams during the transmission of the Data field of the S1G\_SHORT preamble PPDU. The cyclic shift value for space-time stream out of total space-time streams is shown in Table 23-9 (Cyclic shift values for the S1G\_SHORT preamble PPDU).

## Changes for CID 9012, 9080, 9081

Instruction to Editor: Modify text on Page 462 starting at Line 41 in Section 23.3.8.3.1 of TGah\_D6.0

The cyclic shift values defined in this subclause apply to the STF, LTF, SIG and Data fields of the S1G\_1M PPDU. Throughout the S1G\_1M preamble, cyclic shifts are applied to prevent beamforming when similar signals are transmitted in different space-time streams. The STF, LTF, and SIG fields start as single-stream during generation but are replicated up to streams. For the LTF, these replicated streams undergo P-matrix mapping prior to CSD application as shown in Figure 23-6 (Generation of LTF symbols). For the STF and SIG the CSDs are applied per stream immediately after replication.The same cyclic shift is applied to the streams during the transmission of the Data field of the S1G\_1M PPDU. The cyclic shift value for space-time stream out of total space-time streams is shown in Table 23-17 (Cyclic shift values of S1G\_1M PPDU).

## Changes for CID 9020

Instruction to Editor: Modify text on Page 447 starting at Line 47 in Section 23.3.8.2.2.1.2 of TGah\_D6.0

### 23.3.8.2.2.1.2 Cyclic shift for S1G modulated fields

This subclause describes the set of cyclic shift values (defined per-antenna) to be applied to the omnidirectional portion of the S1G\_LONG preamble, namely the STF, LTF, and SIG-A fields. The STF, LTF, and SIG-A fields start as single-stream during generation but are replicated up to streams. These fields are mapped to the transmit antennas, at which point the cyclic shifts are applied. The cyclic shift values are defined in Table 23-12 (Per antenna cyclic shift values of S1G\_LONG preamble PPDU), which specifies the per-antenna cyclic shift value for antenna of the total transmit antennas.

Instruction to Editor: Modify text 23.3.8.2.2.2.2 (Cyclic shift for S1G modulated fields) of TGah\_D6.0

### 23.3.8.2.2.2.2 Cyclic shift for S1G modulated fields

This subclause describes the set of cyclic shift values (defined per-space-time-stream) to be applied to the beamchangeable portion of the S1G\_LONG preamble, namely the D-STF, D-LTF, and SIG-B fields. In a transmission, these fields start as single stream and are replicated up to streams at which point the cyclic shifts are applied. The cyclic shift values are defined in Table 23-13 (Per space-time-stream cyclic shift values of S1G\_LONG preamble PPDU), which specifies the per-stream cyclic shift value for space-time stream out of total space-time streams.

When the S1G\_LONG preamble PPDU is used for a MU transmission, the cyclic shifts of the beamchangeable portion are applied sequentially, first per user and then per space-time stream up to the total number of users and space-time streams as follows: the cyclic shift of the space-time stream number for user is given by , of the row corresponding to in Table 23-13 (Per space-time-stream cyclic shift values of S1G\_LONG preamble PPDU). In this case, the index n takes into account the cyclic shifts already applied to space-time streams of prior users (), and the space-time stream index () of the current user in the sequence.

is defined in Table 23-6 (Frequently used parameters)

## Changes for CID 9053, 9054

Instruction to Editor: Modify text on Page 485 Line 60 in Section 23.3.16.1 of TGah\_D6.0

NOTE 3—For rules regarding TX center frequency leakage levels see 23.3.16.4.2 (Transmitter center frequency leakage). Transmit modulation accuracy specifications are described in 23.3.16.4.2 (Transmitter center frequency leakage) and 23.3.16.4.3 (Transmitter constellation error). The test method is described in 23.3.16.4.4 (Transmitter modulation accuracy (EVM) test). The spectral mask requirements in this subclause do not apply to the RF LO leakage.

Instruction to Editor: Modify text on Page 492 Line 50 in Section 23.3.16.4.2 of TGah\_D6.0

### 23.3.16.4.2 Transmitter center frequency leakage

TX LO leakage is a consequence of the RF local oscillator (LO) and is the DC power emitted at its tuned center frequency. This TX LO leakage shall meet the following requirements for all formats and bandwidths:

— When the RF LO is in the center of the transmitted PPDU BW, the power measured at the center of transmission BW using resolution BW 31.25 kHz shall not exceed the average power per-subcarrier of the transmitted PPDU, or equivalently,( ), where is the transmit power per antenna in dBm, and is defined in Table 23-4 (Timing-related constants).

## Changes for CID 9016

Instruction to Editor: Modify text on Page 404 Line 4 in Section 23.2.2 of TGah\_D6.0

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| --- | --- | --- | --- | --- |
| APEP\_LENGTH | FORMAT is S1G | If equal to 0, indicates an S1G NDP PPDU for both RXVECTOR and TXVECTOR.  If greater than 0 in the TXVECTOR, indicates the number of octets in the A-MPDU pre-EOF padding (see 10.13.2 (A-MPDU length limit rules)) carried in the PSDU. This parameter is used to determine the number of OFDM symbols in the Data field that do not appear after a subframe with 1 in the EOF subfield. | MU | O |
| Otherwise | See corresponding entry in Table 19-1 and Table 21-1. | | |