IEEE P802.11
Wireless LANs

|  |
| --- |
| SB0 Comment Resolutions for Clause 24 |
| Date: 2016-01-12 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Eugene Baik | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92109 |  | eugeneb@qca.qualcomm.com |

Abstract

This submission proposes resolutions for comments in Clause 24 and Annex E of TGah Draft 5.1 with the following CIDs:

Clause 24 CIDs: 8038, 8460, 8461, 8462, 8509, 8511, 8512, 8514, 8515, 8516, 8518, 8519, 8520, 8521, 8522, 8525, 8528, 8530, 8531, 8532, 8534, 8535, 8536, 8545, 8546, 8547, 8548

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 24 CIDs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Line** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 8038 | 337 | 24 | 9.53 | "shall set the Traveling Pilot Support field in the S1G Capabilities element to 1 or 3"Magic numbers are inherently evil, because they effectively duplicate normative specification. This introduces the possibility of error in the published amendment, and the introduction of errors during its maintenance lifetime. | At the cited location, expand to the names of these values. If no names exist, create them.Generally, review the entire draft for the use of "magic numbers" - i.e., values with a meaning defined elsewhere in the document. Introduce names for those values, if necessary, and replace such references with the named value.I'm willing to tolerate 0s and 1s to stand for "false" and "true" or "disabled" and "enabled" etc.. | Revise.Agree, should clarify that the values 1 or 3 correspond to 2-bit binary values “01” and “11”, where the first bit (B22) position represents Travelling pilot support for single space-time stream, and the second bit position (B23) represents Travelling pilot support for single+two space-time stream operation, within the S1G Capabilities Info field.Instruction to Editor: please apply “Changes for CID 8038” detailed in 11-16/0006r1. |
| 8460 | 414 | 30 | 24.3.4.3.3 | 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. | Suggest to apply CSD for each transmit chain. Or remove step g) | Reject.The CSD is already being applied to the SIG field, as the commenter suggests.Even though the SIG field for S1G\_SHORT is considered single-stream at the time of encoding/modulation, the single stream is replicated up to N\_sts streams for the input to the P\_HTLTF matrix mapping block(step (f)). After the P-matrix application, there are N\_sts streams going into the CSD block (step (g)). Hence, the CSDs are being applied to the SIG field. This is similar to the application of CSDs to the STF and LTF fields, as shown in Figure 24-6 (Generation of LTF symbols). Additional illustrations can be found in document 11-12/0833r1 (802.11ah CSD Table Values), slides 23-25. |
| 8461 | 415 | 37 | 24.3.4.4.1 | 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. | Suggest to apply CSD for each transmit chain. Or remove step e) | Reject.The CSD is already being applied to the STF field, as the commenter suggests.Even though the STF field for S1G\_1M is considered single-stream at the time of encoding/modulation, the single stream is replicated up to N\_sts streams for the input to the P\_HTLTF matrix mapping block(step (f)). After the P-matrix application, there are N\_sts streams going into the CSD block (step (g)). Hence, the CSDs are being applied to the STF field. This is similar to the application of CSDs to the LTF field, as shown in Figure 24-6 (Generation of LTF symbols). Additional illustrations can be found in document 11-12/0833r1 (802.11ah CSD Table Values), slides 23-25. |
| 8462 | 416 | 38 | 24.3.4.4.3 | 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. | Suggest to apply CSD for each transmit chain. Or remove step g) | Reject.The CSD is already being applied to the SIG field, as the commenter suggests.Even though the SIG field for S1G\_1M is considered single-stream at the time of encoding/modulation, the single stream is replicated up to N\_sts streams for the input to the P\_HTLTF matrix mapping block(step (f)). After the P-matrix application, there are N\_sts streams going into the CSD block (step (g)). Hence, the CSDs are being applied to the SIG field. This is similar to the application of CSDs to the STF and LTF fields, as shown in Figure 24-6 (Generation of LTF symbols).  |
| 8509 | 386 | 20 | 24.1.1 | A S1G AP may support MCSs 8 and 9, while a SIG non-AP STA may support MCSs 3-9. Supporting MCSs 3-9 for non AP STA is missing. | Insert the phrase "; non-AP STA may support S1G-MCS 3-7" after the phrase ''S1G-MCSs 8 and 9' | Revise Instruction to Editor: please apply “Changes for CID 8509” detailed in 11-16/0006r1. |
| 8511 | 390 | 27 | 24.2.2 | Scenario of NUM\_STS equals to 1 is missing. When NUM\_STS=1, beamforming may be performed and thus smoothing recommendation is needed. | Remove 'If NUM\_STS is larger than 1, " Change "indicates" to "Indicates" | Revise. For S1G\_LONG formats, the SMOOTHING and BEAM\_CHANGE elements in TXVECTOR and RXVECTOR are tied to the Beamchange/Smoothing indication bit in the SIG-A field.When NUM\_STS > 1, the Beamchange/Smoothing indication bit denotes whether to smooth the frequency domain channel estimate. This is carried in RXVECTOR and TXVECTOR through the SMOOTHING element. When NUM\_STS == 1, the Beamchange/Smoothing indication bit denotes beamchange/no beamchange. This is signalled through the BEAM\_CHANGE element of TXVECTOR and RXVECTOR. The receiver can then decide whether to smooth based on whether beamforming has changed the Q-matrix (i.e. beamchange). Hence no change to the earlier SMOOTHING element is needed.However, SIG-A definition for Beamchange/Smoothing Indication is not clear. Instruction to Editor: please apply “Changes for CID 8511/8512” detailed in 11-16/0006r1. |
| 8512 | 390 | 35 | 24.2.2 | Scenario of NUM\_STS equals to 1 is missing. When NUM\_STS=1, beamforming may be performed and thus smoothing recommendation is needed. | Remove 'If NUM\_STS is larger than 1, " replace "indicates" with "Indicates" | Revise. For S1G\_LONG formats, the SMOOTHING and BEAM\_CHANGE elements in TXVECTOR and RXVECTOR are tied to the Beamchange/Smoothing indication bit in the SIG-A field.When NUM\_STS > 1, the Beamchange/Smoothing indication bit denotes whether to smooth the frequency domain channel estimate. This is carried in RXVECTOR and TXVECTOR through the SMOOTHING element. When NUM\_STS == 1, the Beamchange/Smoothing indication bit denotes beamchange/no beamchange. This is signalled through the BEAM\_CHANGE element of TXVECTOR and RXVECTOR. The receiver can then decide whether to smooth based on whether beamforming has changed the Q-matrix (i.e. beamchange). Hence no change to the earlier SMOOTHING element is needed. However, SIG-A definition for Beamchange/Smoothing Indication is not clear. Instruction to Editor: please apply “Changes for CID 8511/8512” detailed in 11-16/0006r1. |
| 8514 | 413 | 27 | 24.3.4.3.1 | 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. | Suggest to apply CSD for each transmit chain. Or remove step e) | Reject.The CSD is already being applied to the STF field, as the commenter suggests.Even though the STF field for S1G\_SHORT is considered single-stream at the time of encoding/modulation, the single stream is replicated up to N\_sts streams for the input to the P\_HTLTF matrix mapping block(step (f)). After the P-matrix application, there are N\_sts streams going into the CSD block (step (g)). Hence, the CSDs are being applied to the STF field. This is similar to the application of CSDs to the LTF field, as shown in Figure 24-6 (Generation of LTF symbols). Additional illustrations can be found in document 11-12/0833r1 (802.11ah CSD Table Values), slides 23-25. |
| 8515 | 425 | 56 | 24.3.7 | For SIG-1M and SIG\_SHORT, N\_STS,u=1 should be valid only for STF and SIG field. For data field, N\_STS>1 should be supported for SU MIMO transmission. | Suggest to specify N\_STS,u=1 is for STF and SIG fields, and for data portion N\_STS=N\_STS,0 is the number of space-time streams. | Revise.The parameters N\_STS and N\_STS,u are always defined for a PPDU as the number of spatial streams in the Data field. The fields of the preamble such as the STF, LTF, SIG are always single stream at modulation/encoding by definition. The time domain representation equations in 24.3.8.2 and 24.3.8.3 for the STF, LTF, SIG/SIG-A fields hence do not reference N\_STSThere is a mistake on Line 56, for S1G\_1M and S1G\_SHORT, N\_STS = N\_STS,0Instruction to Editor: please apply “Changes for CID 8515, 8516, 8518, 8519” detailed in 11-16/0006r1. |
| 8516 | 425 | 56 | 24.3.7 | The use of 'N\_STS,u' is confusing since SIG-1M and SIG\_SHORT support SU only. | Change 'N\_STS,u' to 'N\_STS,0' | ReviseThere is a mistake on Line 56, which should read N\_STS = N\_STS,0Instruction to Editor: please apply “Changes for CID 8515, 8516, 8518, 8519” detailed in 11-16/0006r1. |
| 8518 | 426 | 18 | 24.3.7 | For SIG-1M and SIG\_SHORT, N\_SS,u=1 should be valid only for STF and SIG field. For data field, N\_SS>1 should be supported for SU MIMO transmission. | Suggest to specifiy N\_SS,u=1 is for STF and SIG fields, and for data portion N\_SS=N\_SS,0 is the number of spatial streams. | ReviseThere is a mistake on Line 18, which should read N\_SS = N\_SS,0Instruction to Editor: please apply “Changes for CID 8515, 8516, 8518, 8519” detailed in 11-16/0006r1. |
| 8519 | 426 | 18 | 24.3.7 | The use of 'N\_SS,u' is confusing since SIG-1M and SIG\_SHORT support SU only. | Change 'N\_SS,u' to 'N\_SS,0' | ReviseThere is a mistake on Line 18, which should read N\_SS = N\_SS,0Instruction to Editor: please apply “Changes for CID 8515, 8516, 8518, 8519” detailed in 11-16/0006r1. |
| 8520 | 429 | 46 | 24.3.7 | Notation '1 MHz\_DUP\_OFDM-Data' is not defined anywhere | Change to 'S1G\_DUP\_1M-Data' | Revise.Agree, the naming of the fields in the table needs to be updated to match the naming conventions used in the rest of Clause 24.Instruction to Editor: please apply “Changes for CID 8520, 8521, 8522” detailed in 11-16/0006r1. |
| 8521 | 429 | 49 | 24.3.7 | Notation '2 MHz\_DUP\_OFDM-Data' is not defined before | Change to 'S1G\_DUP\_2M-Data' | Revise.Agree, the naming of the fields in the table needs to be updated to match the naming conventions used in the rest of Clause 24.Instruction to Editor: please apply “Changes for CID 8520, 8521, 8522” detailed in 11-16/0006r1. |
| 8522 | 429 | 53 | 24.3.7 | Notation '1 MHz\_DUP\_OFDM-Data' and ''1 MHz\_DUP\_OFDM-Data'' are not defined before | Change to 'S1G\_DUP\_1M-Data' and 'S1G\_DUP\_2M-Data' | Revise.Agree, the naming of the fields in the table needs to be updated to match the naming conventions used in the rest of Clause 24.Instruction to Editor: please apply “Changes for CID 8520, 8521, 8522” detailed in 11-16/0006r1. |
| 8525 | 434 | 48 | 24.3.8.2.1.3 | Should clarify about the operation dot product operation for the two vectors since it may also be inner product or other operations | add the explanation that the dot product operation is the outer product or tensor product of two vectors | Revise.Agree that the multiplication is an outer product (ie. x) operation. Should replace the “dot” with a “cross” multiplication in Equation 24-15, and likewise for Equation 24-40Instruction to Editor: Please change the “dot” multiply sign to a “cross” multiply sign in Equation 24-15 (P441L35 in D5.1) and Equation 24-40 (P466L15 in D5.1)  |
| 8528 | 436 | 59 | 24.3.8.2.1.4 | BPSK should be QBPSK | Change to 'mapped to a QBPSK constellation, and...' | Reject.The QBPSK modulation is handled by the 90 degree rotation step (to both symbols) detailed in the next paragraph, on page 438. |
| 8530 | 433 | 37 | 24.3.8.2.1.2 | According to equation (24-14), CSD is not applied to STF field even though multiple transmission chains are available.This may create unintended BF, and no CSD gain for non-BF SISO transmission. | Suggest to apply CSD for each transmit chain. Or remove step summation over m in the equation. | Reject.As described in 24.3.4.2.1 and 24.3.4.3.1 (Construction of STF), CSDs are in fact applied to each of the N\_sts branches of the STF.In Equation 24-14, the CSDs applied for the STF are represented as complex rotations applied per tone k (i.e. exp(j\*2pi\*k\*deltaF(t-T\_CS(m))), where T\_CS(m) is the CSD for spatial stream index m. |
| 8531 | 439 | 3 | 24.3.8.2.1.4 | According to equation (24-18), CSD is not applied to SIG field even though multiple transmission chains are available. This may create unintended BF, and no CSD gain for non-BF SISO transmission. | Suggest to apply CSD for each transmit chain. Or remove step summation over m in the equation. | Reject.As described in 24.3.4.2.3 and 24.3.4.3.3 (Construction of SIG), CSDs are in fact applied to each of the N\_sts branches of the SIG field.In Equation 24-18, the CSDs applied for the SIG are represented as complex rotations applied per tone k (i.e. exp(j\*2pi\*k\*…), where T\_CS(m) is the CSD for spatial stream index m. |
| 8532 | 456 | 23 | 24.3.8.3.2 | According to equation (24-37), CSD is not applied to STF field even though multiple transmission chains are available. This may create unintended BF, and no CSD gain for non-BF SISO transmission. | Suggest to apply CSD for each transmit chain. Or remove step summation over m in the equation. | Reject.As described in 24.3.4.4.1 (Construction of 1MHz STF), CSDs are in fact applied to each of the N\_sts branches of the STF.In Equation 24-37, the CSDs applied for the STF are represented as complex rotations applied per tone k (i.e. exp(j\*2pi\*k\*deltaF(t-T\_CS(m))), where T\_CS(m) is the CSD for spatial stream index m. |
| 8534 | 457 | 13 | 24.3.8.3.3 | In equation (24-38) and (24-39) notation 'LTFk' is utilized. The same notation was used before in S1G\_LONG and S1G\_SHORT, however, they refer to a different sequence. | Suggest to use a new notation, i.e., LTF^1M\_k | Reject.The parameter LTF\_k is not a globally defined parameter in Clause 24, and its use in Equation 24-38 and 24-39 is defined immediately below (Line 55) as LTF\_{-16:15} = …, where k is over the valid LTF tones.  |
| 8535 | 460 | 43 | 24.3.8.3.4 | According to equation (24-42), CSD is not applied to SIG field even though multiple transmission chains are available. This may create unintended BF, and no CSD gain for non-BF SISO transmission. | Suggest to apply CSD for each transmit chain. Or remove step summation over m in the equation. | Reject.As described in 24.3.4.4.3 (Construction of 1MHz SIG), CSDs are in fact applied to each of the N\_sts branches of the SIG field.In Equation 24-42, the CSDs applied for the SIG are represented as complex rotations applied per tone k (i.e. exp(j\*2pi\*k\*…), where T\_CS(m) is the CSD for spatial stream index m. |
| 8536 | 459 | 40 | 24.3.8.3.4 | For MCS10, the maximum signaled length is 511 Bytes, which could be too small. | For MCS10, always assume that AGG is OFF, thus the AGG field can be used as an extention bit for Length field. In this way, we extend the maximum signaled length from 511 to 1023 Bytes for MCS10. | Reject.Larger payloads can be handled by setting Aggregation to be ON. During design, it was decided to not have the Aggregation criteria and procedure for S1G\_1M be different from S1G\_SHORT. |
| 8545 | 475 | 24 | 24.3.11 | Transmission of STF/SIG field with NDP should be defined. Note, with S1G\_SHORT, CSD is not mandated for STF/SIG transmission, which may create unintended BF. | Add explanations for transmission of STF/SIG fields | Reject.Section already describes that NDPs use the S1G\_SHORT or S1G\_1M format and would follow their respective procedures for STF, LTF, SIG construction. This includes application of CSDs.Section also already describes how certain fields of SIG should be set for NDP sounding and CMAC NDPs (CMAC frame body format is not in the scope of Clause 24, and defined in a MAC section).  |
| 8546 | 478 | 2 | 24.3.16.1 | RF LO' should be defined before use | Define RF LO | Reject.RF LO is a commonly used term across the overall IEEE 802.11 spec and its subsequent amendments. It should already be defined elsewhere, and if not, Clause 24 is not the right place to do so. |
| 8547 | 481 | 38 | 24.3.16.2 | Not clear whether E\_{I,avg} is the energy measured at transmitter side or receiver side. | Please clarify | Reject.This is part of the section titled “S1G transmit specification”, which defines transmitter conformance/compliance. It should hence be clear that measurements be done at the transmitter. |
| 8548 | 492 | 56 | 24.3.17.5.4.2 | It is not clear whether the second condition assumes the start of the S1G\_1M PPDU detection is missing and the condition is for mid packet detection. Note the first condition is clearly defined for the start of packet detection. In the case of mid packet detection, it is hard to determine whether the packet is a S1G\_1M PPDU. | Please clarify | Revise.The section states that the PHY shall issue a PHY-CCA.indication(BUSY, {primary1}) signal if “one of the following conditions is present in an otherwise idle primary 1MHz channel”, which means either of the 2 listed conditions can trigger the busy indication.Agree that with midpacket detection, we cannot distinguish between S1G\_1M and other S1G PPDUs. The text should be modified since the intention is to be sensitive to any S1G PPDU. Instruction to Editor: please apply “Changes for CID 8548” detailed in 11-16/0006r1. |

## Changes for CID 8038

Instruction to Editor: Modify text on Page 344, Line 25 in TGah\_D5.1

### 9.53 Traveling Pilot Operation

An S1G STA with dot11S1GTravelingPilotOptionActivated equal to true shall set the Traveling Pilot Support field in the S1G Capabilities Info field of the S1G Capabilities element, as described in 8.4.2.197 (S1G Capabilities element), to:

* 1 (i.e. B22 = 1, B23 = 0) if reception of traveling pilots is supported only for one space-time stream
* 3 (i.e. B22 = 1, B23 = 1) if reception of traveling pilots is supported for both one and two space-time streams

An S1G STA with dot11S1GTravelingPilotOptionActivated equal to false shall set the Traveling Pilot Support field in the S1G Capabilities element to 0 (i.e. B22 = 0, B23 = 0).

An S1G STA shall not transmit a frame with TXVECTOR parameter DOPPLER equal to 1 to an S1G STA unless the Traveling Pilot Support field of the S1G Capabilities element received from that STA contained a value of 1 or 3 and dot11S1GTravelingPilotOptionActivated is true.

## Changes for CID 8509

Instruction to Editor: Modify text on page Page 392, Line 21 in TGah\_D5.1

An S1G STA may support the following Clause 24 features:

— 2 or more spatial streams (transmit and receive)

— S1G\_LONG preamble when maximum channel width supported is less than 4 MHz

— Beamforming sounding (through S1G NDP) for an AP STA

— Beamforming sounding response (i.e. providing compressed beamforming feedback) for a non-AP STA

— STBC (transmit and receive)

— LDPC (transmit and receive)

— S1G MU PPDUs (transmit and receive)

—4 MHz channel widths

—8 MHz channel widths

—16 MHz channel widths

— S1G-MCSs 8 and 9 (transmit and receive) for an AP STA, and S1G-MCSs 3-9 (transmit and receive) for a non-AP STA

— Short Guard Interval

— Traveling Pilots

## Changes for CID 8511/8512

24.3.8.2.2.1.5 SIG-A definition, Page 453, Line 44 in TGah\_D5.1

Instruction to Editor: modify the text in the box for Beam Change/Smoothing Indication:

If Nsts subfield indicates 1 space-time stream, this field is a Beam Change Indication:

* A value of 1 indicates that the Q matrix is changed from the omnidirectional portion to the beam changeable portion of the preamble, in at least one of the nonzero subcarriers of the omnidirectional portion.
* A value of 0 indicates that the Q matrix is unchanged in all the nonzero sub-carriers of the omnidirectional portion.

If Nsts subfield indicates more than 1 space-time stream, this field is a Smoothing Indication:

* A value of 1 indicates that channel smoothing is recommended,
* A value of 0 indicates that channel smoothing is not recommended.

See Note-1.

See Note-2.

## Changes for CID 8515, 8516, 8518, 8519

Section 24.3.6, Page 431, Line 61 in TGah\_D5.1

Instruction to Editor: modify the text in the box for :

Number of space-time streams.

For S1G\_LONG, the omnidirectional portion always has N STS,u =1 (see Note 1); and for the beam changeable portion N STS,u is the number of space-time streams for user u, u = 0,…, N\_u -1.

For S1G\_1M and S1G\_SHORT, .

For an S1G SU PPDU, N\_STS = N\_STS,0; for an S1G MU PPDU, N\_STS is undefined.

Section 24.3.6, Page 432, Line 18 in TGah\_D5.1

Instruction to Editor: modify the text in the box for :

Number of spatial streams.

For S1G\_LONG, the omnidirectional portion always has N\_SS,u =1 (see Note 2); and for the beam changeable portion N\_SS,u is the number of space-time streams for user u, u = 0,…, N\_u -1.

For S1G\_1M and S1G\_SHORT, .

For an S1G SU PPDU, N\_SS = N\_SS,0 ; for an S1G MU PPDU, N\_SS is undefined.

## Changes for CID 8520, 8521, 8522

Instruction to Editor: in Section 24.3.7 Page 436 in TGah\_D5.1:

Change instance of “1MHz\_DUP\_OFDM-Data” to “S1G\_DUP\_1M – Data” at Page 436, Line 4

Change instance of “2MHz\_DUP\_OFDM-Data” to “S1G\_DUP\_2M – Data” at Page 436, Line 7

Change Note 1 at Line 10, with the modifications to text as shown below:

NOTE 1—For notational convenience, S1G\_DUP\_1M – Data and S1G\_DUP\_2M – Data is used as a label for the Data field of a duplicate PPDU with format types S1G\_DUP\_1M and S1G\_DUP\_2M, respectively.

## Changes for CID 8548

Section 24.3.17.5.4.2, Page 502 and 503 in TGah Draft 5.1

Instruction to Editor: Please modify the text below as follows:

For devices operating in type 2 channels, if the device intends to transmit an 8 or 16 MHz channel width PPDU and the device implements the procedure and rules for high intended BW transmission channel access described in 9.22.2.5a (EDCA channel access in an S1G BSS), the PHY shall issue a PHY- CCA.indication(BUSY,{primary1}) if one of the following conditions is present in an otherwise idle primary 1 MHz channel:

— The start of an S1G\_1M PPDU or duplicate(#8148) S1G\_1M PPDU detected in the primary 1 MHz channel at or above - 86 dBm within the primary 1 MHz channel with >90% probability within a period aCCATime (see 24.4.4 (PHY characteristics)).

— Any S1G PPDU detected at or above -86 dBm with >90% probability within a period of aCCAMidTime (see 24.4.4 (PHY characteristics)).