IEEE P802.11  
Wireless LANs

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| --- | --- | --- | --- | --- |
| Comment resolutions for CIDs: 2964, 3270, 2061, 2418, 2424, 2231, 2423, 3143, 2320, 2321, 2965, 2417, 3124 | | | | |
| Date: 2011-11-03 | | | | |
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|  |  |  |  |  |

Abstract

The baseline is 11ac D 1.2. This document provides the comment resolutions for the CIDs: 2964, 3270, 2061, 2418, 2424, 2231, 2423, 3143, 2320, 2321, 2965, 2417, and 3124.

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| --- | --- | --- | --- | --- |
| CID | Page | Comment | Proposed Change | Resn Status |
| 2964 | 144.12 | In the description of B2-B3 of VHT-SIG-A2, the first "B3" should be "B2". | change "B3" to "B2" | Agree in principle.  See CID2060 |
| 3270 | 144.12 | The bit identification "B3:" is not correct. | Change "B3:" to "B2:". | Agree in principle.  See CID2060 |
| 2061 | 144.25 | In an MU-MIMO PPDU case, B4-B7 in VHT-SIG-A2 do not carry MCS index, so the name of this field should be reconsidered. | Instead of "MCS", "MCS/Coding" should be used. | Agree in principle |
| 2418 | 144.09 | Since these fields are really composed of subfields and the subfields need to be explicitly referred to elsewhere, the section talks of B0, B1 etc. Better is to give each atomic component its own distinct name "Partial AID", "NSTS0", "Short GI" "Short GI Nsym Disambiguation" etcetc | Give atomic components their own name | Agree in principle |

Discussion:

CID 2964 and 3270 overlapped with CID 2060, which had passed in the motion. For the clarification, parts of subfields in VHT-SIG-A are renamed as below.

**Editing Instructions:**

*Page 183, line 26, part of Table 22-10:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| VHT-SIG-A1 | B10-B21 | NSTS/Partial AID | 12 | For MU: 3 bits/user with maximum of 4 users (user *u* uses  bits B(10+3u )-B(12+3u ),u=0,1,2,3 )  Set to 0 for 0 space time streams  Set to 1 for 1 space time stream  Set to 2 for 2 space time streams  Set to 3 for 3 space time streams  Set to 4 for 4 space time streams  Values 5-7 are reserved  For SU:  B10-B12  Set to 0 for 1 space time stream  Set to 1 for 2 space time streams  Set to 2 for 3 space time streams  Set to 3 for 4 space time streams  Set to 4 for 5 space time streams  Set to 5 for 6 space time streams  Set to 6 for 7 space time streams  Set to 7 for 8 space time streams  B13-B21  Partial AID: Set to the value of the TXVECTOR parameter  PARTIAL\_AID. Partial AID provides an abbreviated  indication of the intended recipient(s) of the frame (see  9.17a (Group ID and Partial AID in VHT PPDUs)). |

*Page 184, line 9, part of Table 22-10:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| VHT-SIG-A2 | B0~~-B1~~ | Short GI | ~~2~~1 | ~~B0:~~  Set to 0 if short guard interval is not used in the Data field.  Set to 1 if short guard interval is used in the Data field. |
| B1 | Short GI Nsym disambiguation | 1 | ~~B1:~~  Set to 1 if short guard interval is used and *NSYM* mod 10 = 9, otherwise set to 0. *NSYM* is defined in 22.4.3 (TXTIME and PSDU\_LENGTH calculation). |
| B2~~-B3~~ | SU/MU[0] Coding | ~~2~~1 | ~~B3:~~  For SU, B2 is set to 0 for BCC, 1 for LDPC  For MU, if ~~the NSTS field for user 0~~ MU[0] NSTS is non-zero, then B2 indicates the coding used for user 0; set to 0 for BCC and 1 for LDPC. If ~~the NSTS field for user 0~~ MU[0] NSTS is set to 0, then this field is reserved and set to 1. |
| B3 | LDPC Extra OFDM symbol | 1 | ~~B3:~~  Set to 1 if the LDPC PPDU encoding process, or at least one LPDC user’s PPDU encoding process, results in an extra OFDM symbol (or symbols) as described in 22.3.10.5.2 (LDPC coding) and 22.3.10.5.3 (Encoding process for MU transmissions). Set to 0 otherwise. |
| B4-B7 | SU MCS/MU[1-3] Coding | 4 | For SU:  MCS index  For MU:  If ~~the NSTS field for user 1~~ MU[1] NSTS is non-zero, then B4 indicates coding for user 1: set to 0 for BCC, 1 for LDPC. If ~~NSTS for user 1~~ MU[1] NSTS is set to 0, then B4 is reserved and set to 1. If ~~the NSTS field for user 2~~ MU[2] NSTS is non-zero, then B5 indicates coding for user 2: set to 0 for BCC, 1 for LDPC. If ~~NSTS for user 2~~ MU[2] NSTS is set to 0, then B5 is reserved and set to 1. If ~~the NSTS field for user 3~~ MU[3] NSTS is non-zero, then B6 indicates coding for user 3: set to 0 for BCC, 1 for LDPC. If ~~NSTS for user 3~~ MU[3] NSTS is set to 0, then B6 is reserved and set to 1. B7 is reserved and set to 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CID | Page | Comment | Proposed Change | Resn Status |
| 2417 | 142.15 | Traditionally this information has been presented in a diagram | Add diagram | Agree in principle |

Discussion:

Insert two figures for VHT-SIG-A1 and VHT-SIG-S2 structure respectively. The changing of fields name in other paragraphs in the draft can be seen in annex.

**Editing Instructions:**

*Insert in after Table 22-10:*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Composite name | BW | R | STBC | Group ID | NSTS/Partial AID | | | | TXOP\_PS\_NOT\_ALLOWED | R |
| SU name | SU NSTS | Partial AID | | |
| MU name | MU[0] NSTS | MU[1] NSTS | MU[2] NSTS | MU[3] NSTS |
|  | 0-1 | 2 | 3 | 4-9 | 10-12 | 13-15 | 16-18 | 19-21 | 22 | 23 |

Figure 22-9a VHT-SIG-A1 structure

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Composite name | Short GI | Short GI Nsym Disambiguation | SU/MU[0] Coding | LDPC Extra OFDM Symbol | SU MCS/MU[1-3] Coding | | | | Beam-formed | R | CRC | Tail |
| SU name | SU MCS | | | | Beam-  formed |
| MU name | MU[1] Coding | MU[2] Coding | MU[3] Coding | R | R |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-17 | 18-23 |

Figure 22-9b VHT-SIG-A2 structure

*paragraph in page 175, line 41 makes the following changes*:

 An example definition of the windowing function, , is given in 18.3.2.5 (Mathematical conventions in the signal descriptions).  is 8 μs for L-STF and L-LTF, 4 μs for L-SIG, VHT-SIG-A, VHT-STF, VHT-LTF and VHT-SIG-B.  is also 4 μs for VHTData when not using the short guard interval (~~B0~~ Short GI field of VHT-SIG-A2 ~~is~~ equals to 0).  is 3.6 μs for VHTData when using the short guard interval (~~B0~~ Short GI field of VHT-SIG-A2 ~~is~~ equals to 1).

*paragraph in page 176, line 28 makes the following changes*:

*T*GI,Field is the guard interval duration used for each OFDM symbol in the field. For L-STF and VHT-STF, *T*GI,Field is 0 μs. For L-SIG, VHT-SIG-A, VHT-LTF and VHT-SIG-B fields, *T*GI,Field = *T*GI . For the L-LTF field, *T*GI,Field = *T*GI2 . For the Data field, *T*GI,Field = *T*GI when not using the short guard interval (~~B0~~ Short GI field of VHT-SIG-A2 ~~is~~ equals to 0) and *T*GI,Field = *T*GIS when using the short guard interval (~~B0~~ Short GI field of VHT-SIG-A2 ~~is~~ equals to 1). *T*GI, *T*GI2 and *T*GIS are given in Table 22-5(Timing-related constants).

*paragraph in page 199, line 26 makes the following changes*:

The Data field shall be encoded using either the binary convolutional code (BCC) defined in 22.3.10.5.2 (BCC encoder parsing operation) and 22.3.10.5.3 (Binary convolutional coding and puncturing), or the low density parity check (LDPC) code defined in 22.3.10.5.4 (LDPC coding). The encoder is selected by the SU/MU[0] Coding, MU[1] Coding, MU[2] Coding, or MU[3] Coding field in VHT-SIG-A, as defined in 22.3.8.2.3 (VHT-SIG-A definition).

*paragraph in page 200, line 56 makes the following changes*:

In addition, if *N*SYM computed in Equation (20-41) in step (d) of 20.3.11.7.5 (LDPC PPDU encoding process) is greater than *NSYM,init*, then ~~B3~~ LDPC Extra OFDM Symbol field of VHT-SIG-A2 shall be set to 1. Otherwise, ~~B3~~ LDPC Extra OFDM Symbol field of VHT-SIG-A2 shall be set to 0.

*paragraph in page 202, line 37 makes the following changes*:

In addition, if *N*SYM computed in Equation (22-63) is greater than *N*SYM\_max\_init computed in Equation (22-61), then ~~B3~~ LDPC Extra OFDM Symbol field of VHT-SIG-A2 shall be set to 1. Otherwise, ~~B3~~ LDPC Extra OFDM Symbol field of VHT-SIG-A2 shall be set to 0.

*paragraph in page 214, line 1 makes the following changes*:

*T*GI,Datais the guard interval duration. *T*GI,Data = *T*GI when not using the short guard interval (~~B0~~ Short GI field of VHT-SIG-A2 ~~is~~ equals to 0) and *T*GI,Data = *T*GIS when using the short guard interval (~~B0~~ Short GI field of VHT-SIG-A2 ~~is~~ equals to 1). *T*GI and *T*GIS are given in Table 22-5 (Timing-related constants).

*paragraphs in page 217, line 35 makes the following changes*:

A value in the Group ID field in VHT-SIG-A (see 22.3.8.2.3 (VHT-SIG-A definition)) in the range 1 to 62 indicates an MU-MIMO packet. Prior to transmitting a MU-MIMO packet, group definitions have been established by the AP for MU-MIMO capable STAs using the Group ID Management frame as defined in 8.5.18.3 (Group ID Management frame format). When a STA receives a Group ID Management frame, the STA’s MLME configures the following lookup tables in the PHY via the GROUP\_ID parameter in PHYCONFIG\_VECTOR:

1. Group ID to Membership Status, denoted by MembershipStatusInGroupID[g] for 1 <= g <= 62
2. Group ID to UserPosition, denoted by UserPositionInGroupID[g] for 1 <= g <= 62

When a STA that has these lookup tables configured receives a MU PPDU with the Group ID field in VHT-SIG-A1 for which MembershipStatusInGroupID[k] is equal to 1, where k is the Group ID in VHT-SIG-A1, then the number of space time streams for that STA is indicated in the MU[UserPositionInGroupID[k]] NSTS field in VHT-SIG-A1. The space time streams for the STA follow the space time streams indicated by the MU[0] NSTS, MU[1] NSTS, …, MU[UserPositionInGroupID[k]-1] NSTS fields in VHT-SIG-A1. When an MU-MIMO data packet is received, each STA identifies whether it is a member of the group for this packet by detecting the Group ID field in VHT-SIG-A. If a STA finds that it is a member of the group for the MU-MIMO data packet, the STA reads the number of space-time streams from its corresponding 3 bits in the NSTS field in VHT-SIG-A as determined by the group definition of the corresponding Group ID. At this point, a STA is also able to identify which space-time streams correspond to its own signal and which streams correspond to interference. For an MU-MIMO transmission, VHT-LTF symbols are used to measure not only the channel for a beamformee’s designated signals but also to measure the channel for the interfering signals at the beamformee. While receiving an MU-MIMO transmission, it is recommended that the receiver use its channel knowledge to all spatial streams (including those that are interference) to do receive processing, in order to reduce potential interference from other users' space-time streams.

If a STA finds that it is not a member of the group, or the STA is a member of the group but the corresponding MU[u] NSTS (u=0, 1, 2, or 3) in VHT-SIG-A indicates that there are zero space-time streams for the STA in the packet, then the STA may elect to not process the remainder of the packet.

*paragraph in page 218, line 18 makes the following changes*:

NOTE—The number of VHT-LTF symbols in the NDP is determined by the SU NSTS field in VHT-SIG-A1.

*Sentences in page 235, line 30 makes the following changes:*

Reserved VHT-SIG-A Indication is defined as a VHT-SIG-A with Reserved bits equal to 0 or ~~NSTS per user for MU~~ MU[u] NSTS fields (u=0, 1, 2, 3) set to 5-7 or Short GI ~~with VHT-SIG-A2 B0~~ field set to 0 and ~~VHT-SIG-A2 B1~~ Short GI Nsym Disambiguation field set to 1, or a combination of MCS and NSTS not included in 22.5 (Parameters for VHT MCSs) or any other VHT-SIG-A field bit combinations that do not correspond to modes of PHY operation defined in Clause 22.

*Equation (22-100) in page 236, line 1 makes the following changes:*

Original:

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Revised:



*Paragraph in page 236, line 40 makes the following changes:*

For an SU transmission, ~~B2~~ SU/MU[0] Coding field of VHT-SIG-A2 indicates the type of coding. The PHY entity shall use an LDPC decoder to decode the C-PSDU if this bit is 1, otherwise a BCC decoder shall be used. For an MU transmission, ~~B2, B4, B5 and B6~~ SU/MU[0] Coding, MU[1] Coding, MU[2] Coding and MU[3] Coding fields of VHT-SIG-A2 indicate the type of coding for user 0, 1, 2 and 3, respectively. The PHY entity shall use an LDPC decoder to decode the C-PSDU for the respective user if its bit for its C-PSDU is 1. A BCC decoder shall be used otherwise. When an LDPC decoder is to be used, *Npld* can be computed by Equation (22-57) using *NSYM,init* obtained from Equation (22-102).

*Equation (22-102) in page 236, line 50 makes the following changes:*

Original:

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Revised:



*Part of Table 22-59 in page 263, line 1 makes the following changes:*

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Associate** | **primitive** |
| GI\_TYPE | PMD\_TX\_PARAMETERS.request | Set to 0 indicates short GI is not used in the packet  Set to 1 indicates short GI is used in the packet and Short GI Nsym Disambiguation field equals to 0 in VHT-SIG-A2 ~~B1 is 0~~  Set to 2 indicates short GI is used in the packet and Short GI Nsym Disambiguation field equals to 1 in VHT-SIG-A2 ~~B1 is 1~~ |
| FEC\_CODING | PMD\_TX\_PARAMETERS.request | Indicates which FEC encoding is used.  Enumerated type:  BCC\_CODING indicates binary convolutional code.  LDPC\_CODING\_0 indicates low-density parity check code and LDPC Extra OFDM Symbol field equals to 0 in VHT-SIG-A2 ~~B3 is 0~~.  LDPC\_CODING\_1 indicates low-density parity check code and LDPC Extra OFDM Symbol field equals to 1 in VHT-SIG-A2 ~~B3 is 1~~. |

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| CID | Page | Comment | Proposed Change | Resn Status |
| 2424 | 145.28 | Dk,n,BW -> Dk,n,20; dM'BW(k),n -> dM'20(k),n; M'BW(k) -> M'20(k) (these are 20MHz mappings) |  | Agree. |

Discussion:

This comment is overlapped with CID 2416, the resolution can be found in document 11/1042r1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CID | Page | Comment | Proposed Change | Resn Status |
| 2231 | 145.15 | The formula for VHT-SIG-A contains a multiplication with "j" for symbol n=1 (i.e. VHT-SIG-A2). The preceding text that describes the construction of the complex numbers d\_k,n seems to imply that the rotation of VHT-SIG-A2 is already contained in the numbers D\_k,n. In that case, no explicit rotation is needed anymore. | Make text and formula consistent. | Agree in principle. |

Discussion:

Agree that there is ambiguity about the rotation of VHT-SIG A2 between text and equations. Some modification is made to eliminate this ambiguity.

**Editing Instructions:**

*Page 185, line 2:*

The VHT-SIG-A symbols shall be BCC encoded at rate, R = 1/2, interleaved, mapped to a BPSK constellation, and have pilots inserted following the steps described in 18.3.5.6 (Convolutional encoder), 18.3.5.7 (Data interleaving), 18.3.5.8 (Subcarrier modulation mapping), and 18.3.5.9 (Pilot subcarriers), respectively. The first and second half of the stream of 96 complex numbers generated by these steps is divided into two groups of 48 complex numbers dk,n, k=0…47, where n=0,1 respectively. The BPSK constellation for VHT-SIG-A2 subfield is rotated by 90° counter-clockwise relative to VHT-SIG-A1 subfield in order to accommodate differentiation of the VHT PPDU from a non-HT and HT PPDU. ~~The first and second half of the stream of 96 complex numbers generated by these steps is divided into two groups of 48 complex numbers d~~~~k,n~~~~, k=0…47, where n=0,1 respectively.~~ The time domain waveform for the VHT-SIG-A field in a VHT format packet shall as specified in Equation (22-24).

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| CID | Page | Comment | Proposed Change | Resn Status |
| 2423 | 144.48 | Reference to clause 19 is incomplete given that the bits to be protected only appear in this subclause | "CRC calculated as in 19.xxx with Bits 0-23 of HT-SIG1 and bits 0-9 of HT-SIG2 replaced by bits 0-23 of VHTSIGA1 and bits 0-9 of VHT\_SIGA2 respectively" | Agree |

Discussion:

Agree

**Editing Instructions:**

*Page 184, line 54, part of Table 22-10:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| VHT-SIG-A2 | B10-B17 | CRC | 8 | CRC calculated as in 20.3.9.4.4(CRC calculation for HT-SIG) with ~~C7~~c7 in B10~~, etc~~. Bits 0-23 of HT-SIG1 and bits 0-9 of HT-SIG2 replaced by bits 0-23 of VHTSIGA1 and bits 0-9 of VHT\_SIGA2 respectively. |

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| --- | --- | --- | --- | --- |
| CID | Page | Comment | Proposed Change | Resn Status |
| 3143 | 143.09 | Clarify that STBC must be used for all users in MU case | As in comment | Agree in principle |

Discussion:

Agree in principle.

**Editing Instructions:**

*Page 143, line 9, part of Table 22-10:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| VHT-SIG-A1 | B3 | STBC | 1 | Set to 1 if all streams of all users have space time block coding and set to 0 ~~otherwise~~ if no streams of any user has space time block coding.  NOTE - For some but not all users to have space time block coding is not allowed. |

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| CID | Page | Comment | Proposed Change | Resn Status |
| 2320 | 143.21 | Table 22-10: range for user u is u = 0,1,2,3 | Change to " u = 1, 2, 3, 4 " and accordingly B(7+3u)-B(9+3u) | Disagree  See CID2040. The resolution can be found in the document 11-11-1369-00-00ac-D1\_comment\_resolution\_brianh\_part7.docx. |
| 2321 | 143.22 | Definition includes u=1, which means a single user | My understanding is, that at least 2 users are required for MU operation. Explain difference between Multi-User operation with 1 user and Single User operation, if supported. | Disagree.  *the difference between Multi-user operation with 1 user and Single user operation is only at VHT-SIG-A setting. But it doesn’t necessary to forbid the Multi-User operation with 1 user. How to choose the transmit operation should up to the AP.* |

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| --- | --- | --- | --- | --- |
| CID | Page | Comment | Proposed Change | Resn Status |
| 2965 | 144.39 | 19.3.11.11.2 (Spatial mapping) is not originally for 802.11ac. When citing the content of this subclause, it should be pointed out that the maximum spatial stream is extended to 8. | Add a corresponding explanation to describe the maximum spatial stream is extended to 8. | Agree in principle. |

Discussion:

When the beamforming steering matrix is introduced in clause 20.3.11.11.2, the number of space-time streams and transmit chains don’t have a restriction up to 4, so it doesn’t need an extension for beamforming steering matrix. For further clarification of spatial mapping in VHT, we add the sentence below:

*Sentences in page 215, line 5 makes the following changes:*

Refer to the examples of listed in 20.3.11.11.2 (Spatial mapping) for examples of  that could be used for SU packets. Note that implementations are not restricted to the spatial mapping matrix examples listed in Section 20.3.11.11.2 (Spatial mapping), and the number of transmit chains  could up to 8.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CID | Page | Comment | Proposed Change | Resn Status |
| 3124 | 144.46 | It would simplify implementation, and potentially reduce power consumption if a "sounding bit" were included in the VHT-SIGA. Currently, the beamformee must wait until VHT-SIGB field to compute the steering matrices. | Replace reserve bit B9 in SIGA with a VHT sounding bit. | Disagree  Beamformer will send an announcement before it sends a NDP frame. No matter the announcement is VHT NDPA frame or an NDP announcement bit in HT Control field, beamformee will definitely know when the NDP frame will be received. Furthermore, a NDP can be detected even without relying on the preceding NDPA (and w/o using the VHT-SIG-B).  Receiver will compute the number of data symbols (Nsym) based on L-SIG and VHT-SIG-A using equation (22-100) (D1.2).  If Nsym = 0, then the received packet is an NDP. |

Pre-Motion 1:

Do you accept the resolutions provided to the CIDs and the changes to the spec text as presented in editing instructions sections of this document?

Yes:

No:

Abstain:

**References:**

1. IEEE Draft P802.11ac\_D1.2