IEEE P802.11
Wireless LANs

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| CR on DCM and STBC Combinations |
| Date: 2019-5-10 |
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Abstract

This submission proposes resolutions for the following comments from the letter ballot on P802.11ax D4.0:

21006, 21406, 20715

NOTE – Set the Track Changes Viewing Option in the MS Word to “All Markup” to clearly see the proposed text edits.

**Revision History:**

R0: Initial version.

R1: Updated during May 2019 IEEE meeting

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 21006 | 27 | 441.01 | Re CID 16231: the reviewed/resolver of that comment should probably try a different PDF viewer, since several instances of the statement that STBC is not used with >1SS or DCM remain:Table 27-1, DCM row: DCM is not applied in combination with STBC.Table 27-19, DCM row: DCM is not applied in combination with STBC.Table 27-19, STBC row: DCM is not applied in combination with STBC.Table 27-27, DCM row: DCM is not applied in combination with STBC.27.3.11.9: DCM is not applied with MU-MIMO or with STBC.27.3.11.10: STBC is applied only with 1 spatial stream and only if DCM is not applied. | Delete all but the last cited instance |
| 21406 | 27.2.2 | 451.23 | "STBC is set to 0 when DCM = 1" in Table 27.1. However, in Table 27-19 (line 12, page 527), "both the DCM and STBC fields are 1" is used to indicate "4x HE-LTF and 0.8 us GI." It seems the latter will never happen if we follow the rule in the former (TXVECTOR). | Please clarify or revise. |
| 20715 | 27.3.10.7.2 | 526.07 | Re CID 15978: the proposed change was indeed wrong, but "When DCM = STBC =1 if GI+LTF Size is not 3, the spec has said DCM and STBC cannot be applied simultaneously, hence it will be treated as an invalid mode of HE-SIG-A by the Rx." from the resolution is exactly what the comment was about | At the end of the NOTE in the Description cell for B7 of HE-SIG-A1 in Table 27-19 add "If both the DCM and STBC field are set to 1, the GI+LTF Size field is set to 1.". Above in the cell change "if both the DCM and STBCare set to 1" to "if both the DCM and STBCfields are set to 1" |

**Proposed Resolution: CID 21006**

**Revised**.

Proposed text updates in 11-19/0826 removes all the redundant statements identified by the commenter, except for the ones in 27.3.11.9 (D4.1 P596L49) and 27.3.11.10 (D4.1 P597L32). The location at 27.3.11.9 lists various requirements of DCM, and is the appropriate place to state that DCM is not applied with STBC. 27.3.11.10 is the STBC section, and it is appropriate to say that STBC is not applied when DCM is used. Furthermore, the commenter has suggested to leave 27.3.11.10 unchanged.

In addition, the proposed text updates in 11-19/0826 creates subclause 26.11.8 in which normative statements that DCM and STBC cannot be used together is placed.

Instruction to Editor: Implement the proposed text updates in 11-19/0826r1.

**Proposed Resolution: CID 21406**

**Revised**.

TXVECTOR indicates whether the STBC and/or DCM is ‘used’ in the packet, while the HE-SIG-A is just a ‘signaling mechanism’. Hence, TXVECTOR cannot indicate both STBC=1 and DCM=1 (as such a packet cannot use both STBC and DCM), but the HE-SIG-A does use the ‘fields’ STBC=1 and DCM=1 to indicate certain GI+LTF size. To avoid this confusion, the proposed text updates in 11-19/0826 creates a new table which clearly indicates how the DCM, STBC and GI+LTF Size subfields in HE-SIG-A ‘jointly’ indicate various modes.

Instruction to Editor: Implement the proposed text updates in 11-19/0826r1.

**Proposed Resolution: CID 20715**

**Revised**.

Commenter is correct that when both the STBC and DCM subfields of HE-SIG-A are set to 1, then the GI+LTF Size subfield must be set to value 3. Instead of further expanding the already challenging-to-read NOTE, the proposed text updates in 11-19/0826 creates a new table which clearly indicates how the DCM, STBC and GI+LTF Size subfields in HE-SIG-A ‘jointly’ indicate various modes.

Instruction to Editor: Implement the proposed text updates in 11-19/0826r1.

**Proposed Text Updates: CID 21006, 21406, 20715**

**26.11 Setting TXVECTOR parameters for an HE PPDU**

*TGax Editor: Add the following subclause at D4.1 P414L7.*

**26.11.8 STBC and DCM**

When the TXVECTOR parameter FORMAT is set to HE\_SU or HE\_ER\_SU, an HE STA shall not set the TXVECTOR parameter STBC to 1 if any of the following conditions are met:

* TXVECTOR parameter DCM is set to 1
* TXVECTOR parameter NUM\_STS is not equal to 2
* TXVECTOR parameters HE\_LTF\_TYPE and GI\_TYPE are set to 4x HE-LTF and 0u8s\_GI, respectively

When the TXVECTOR parameter FORMAT is set to HE\_TB, an HE STA shall not set the TXVECTOR parameter STBC to 1 if any of the following conditions are met:

* TXVECTOR parameter DCM is set to 1
* TXVECTOR parameter NUM\_STS is not equal to 2

When the TXVECTOR parameter FORMAT is set to HE\_MU, an HE STA shall not set the TXVECTOR parameter STBC to 1 if any of the following conditions are met:

* At least one element in the TXVECTOR parameter DCM is set to 1
* At least one element in the TXVECTOR parameter NUM\_STS is not equal to 2
* There are two or more elements in the TXVECTOR parameter STA\_ID\_LIST using the same RU

NOTE – Two or more elements in the TXVECTOR parameter STA\_ID\_LIST using the same RU means that DL MU-MIMO is used.

When the TXVECTOR parameter FORMAT is set to HE\_SU or HE\_ER\_SU, an HE STA shall not set the TXVECTOR parameters STBC or DCM to 1 if the TXVECTOR parameters HE\_LTF\_TYPE and GI\_TYPE are set to 4x HE-LTF and 0u8s\_GI, respectively.

*TGax Editor: Edit Table 27-1 of D4.1 as shown below.*

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| Table 27-1 – TXVECTOR and RXVECTOR parameters  |
| Parameter | Condition | Value | TXVECTOR | RXVECTOR |
| STBC | FORMAT is HE\_SU, HE\_MU, HE\_ER\_SU or HE\_TB | Indicates if STBC is used.For an HE MU PPDU and HE TB PPDU where each RU includes no more than 1 user:Set to 1 to indicate that for all RUs the Data field is STBC encodedSet to 0 to indicate that in no RU is the Data field STBC encodedFor an HE SU PPDU or HE ER SU PPDU:Set to 1 to indicate that the Data field is STBC encodedSet to 0 to indicate that the Data field is not STBC encoded | Y | Y |
| Otherwise | See corresponding entry in Table 19-1 (TXVECTOR and RXVECTOR parameters) or Table 21-1 (TXVECTOR and RXVECTOR parameters). |
| DCM | FORMAT is HE\_SU, HE\_MU, HE\_ER\_SU or HE\_TB | Set to 1 to indicate that DCM is used for the Data field.Set to 0 to indicate that DCM is not used for the Data field.NOTE—DCM is applied only to HE-MCSs 0, 1, 3 and 4. DCM is applied only to 1 and 2 spatial streams.  | MU | MU |
| Otherwise | Not present. |

*TGax Editor: Edit Table 27-28 of D4.1 as shown below.*

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| Table 27-18 – HE-SIG-A field of an HE SU PPDU and HE ER SU PPDU  |
| Two Parts of HE-SIG-A | Bit | Field | Number of bits | Description |
| HE-SIG-A1 | B7 | DCM | 1 | Indicates whether or not DCM is applied to the Data field for the MCS indicated.See Table 27-18a for the interpretation of this field.NOTE—DCM is applied only to HE-MCSs 0, 1, 3 and 4. DCM is applied only to 1 and 2 spatial streams.  |
|  | B9 | STBC | 1 | Indicates whether or not STBC is applied to the Data field.See Table 27-18a for the interpretation of this field. |
|  | B21-B22 | GI+LTF Size | 2 | Indicates the GI duration and HE-LTF size.See Table 27-18a for the interpretation of this field. |

*TGax Editor: Add Table 27-18a as shown below at D4.1 P533L31 (after Table 27-18).*

**Table 27-18a – Interpretation of DCM, STBC and GI+LTF size subfields**

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| **Values of subfields in HE-SIG-A of HE SU and ER SU PPDU (see Table 27-18)** | **Interpretation** |
| **DCM** | **STBC** | **GI+LTF Size** | **DCM Applied** | **STBC Applied** | **GI+LTF Size** |
| 0 | 0 | 0 | No | No | 1x HE-LTF and 0.8 µs GI |
| 1 | 2x HE-LTF and 0.8 µs GI |
| 2 | 2x HE-LTF and 1.6 µs GI |
| 3 | 4x HE-LTF and 3.2 µs GI |
| 1 | 0 | 0 | Yes | No | 1x HE-LTF and 0.8 µs GI |
| 1 | 2x HE-LTF and 0.8 µs GI |
| 2 | 2x HE-LTF and 1.6 µs GI |
| 3 | 4x HE-LTF and 3.2 µs GI |
| 0 | 1 | 0 | No | Yes | 1x HE-LTF and 0.8 µs GI |
| 1 | 2x HE-LTF and 0.8 µs GI |
| 2 | 2x HE-LTF and 1.6 µs GI |
| 3 | 4x HE-LTF and 3.2 µs GI |
| 1 | 1 | 0 | Reserved |
| 1 |
| 2 |
| 3 | No | No | 4x HE-LTF and 0.8 µs GI |

*TGax Editor: Edit Table 27-19 of D4.1 as shown below.*

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| Table 27-19 – HE-SIG-A field of an HE MU PPDU  |
| Two Parts of HE-SIG-A | Bit | Field | Number of bits | Description |
|  | B12 | STBC | 1 | In an HE MU PPDU where each RU includes no more than 1 user, set to 1 to indicate all RUs are STBC encoded in the payload, set to 0 to indicate all RUs are not STBC encoded in the payload.STBC does not apply to HE-SIG-B. |

*TGax Editor: Edit Table 27-26 of D4.1 as shown below.*

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| Table 27-26 – User field format for a non-MU-MIMO allocation  |
| Bit | Subfield | Number of bits | Description |
| B19 | DCM | 1 | Indicates whether or not DCM is used.Set to 1 to indicate that the payload of the corresponding user of the HE MU PPDU is modulated with DCM for the MCS.Set to 0 to indicate that the payload of the corresponding user of the PPDU is not modulated with DCM for the MCS. |

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