IEEE P802.11
Wireless LANs

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| FTM in 6 Ghz |
| Date: 2018-09-01 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D3.0 with the following CIDs (1 CID):

* 15824

Revisions:

* Rev 0: Initial version of the document.

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 TGax Draft. This introduction is not part of the adopted material.

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

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

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| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 15824 | Laurent Cariou | 253.05 | 802.11ax included support for the 6GHz band. There needs to be several changes throughout the spec to fully enable this support. | Make the appropriate changes | Revised –Agree in principle with the comment. Proposed resolution adds details throughout the spec to cover the basic 6 GHz functionalities.TGax editor to make the changes shown in 11-18/0180r0 under all headings that include CID 15824. |

**Discussion:**

* Comment resolution document 11-18/1181r5 that we motioned in November F2F meeting proposed, among other things, to not allow FTM frames to be carried in HE PPDUs when these FTM frames are sent by an HE STA, since the HE STA can use the VHT format or the HT format to obtain similar performance.
* Discussions related to operation in the 6 GHz band (please refer to 11-18/1211r2 and other related discussions in the EHT forum e.g., 11-18/1461r1) propose to not allow VHT PPDUs and HT PPDUs in the 6 GHz band due to the inherent benefits that it brings to a greenfield band (reducing number of PPDU formats to carry same information simplifies testing, coexistence, implementation, etc.)
* However, if FTM frames were to not be allowed in HE PPDUs and also VHT PPDUs and HT PPDUs not to be allowed in the 6 GHz band would lead to HE STAs in the 6 GHz band having worse locationing performance w.r.t. their 5 GHz and 2.4 GHz counterpart (since only non-HT PPDU based locationing would be possible).

*In this document we propose to solve the issue by either 1) exempting VHT PPDUs to be allowed in the 6 GHz band when they carry FTM frames and responses to FTM frames or 2) enabling FTM frames to be carried in HE formats (undo some of the changes introduced to D3.2 due to 11-18/1181r5, which will be applicable to the 6 GHz band only).*

*Straw Poll: Which option do you prefer for FTM protocol in the 6 GHz:*

1. *Allow FTM frames in VHT PPDU format*
2. *Allow FTM frames in HE PPDU format*

***Spec text for Option 1:***

1. 27.16.1a HE BSS functionality in 6 GHz band

***TGax editor: Insert the following sentence in subclause below in table 9-282 as follows:***

A STA shall not transmit VHT PPDUs in the 6 GHz band, except when the PPDU contains an FTM frame or a frame sent in response to an FTM frame.

***Spec text for Option 2:***

**9.4.2.167 Fine Timing Measurement Parameters element**

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| * ***TGax editor: Insert the rows below in table 9-282 as follows:***Format And Bandwidth field
 |
| Field value | Format | Bandwidth (MHz) |
| … | … | … |
| 17 | HE | 20 |
| 18 | HE | 40 |
| 19 | HE | 80 |
| 20 | HE | 80+80 |
| 21 | HE (two separate RF LOs) | 160 |
| 22 | HE (single RF LO) | 160 |
| 23-30 | Reserved | Reserved |
| 31 | DMG | 2160 |
| 32–63 | Reserved | Reserved |

***TGax editor: Change the paragraph below in 27.15.2 (PPDU format selection) as follows:***An HE STA should send an Ack frame in the same PPDU format as the soliciting PPDU when the soliciting PPDU a VHT PPDU or HT PPDU containing an FTM frame.

An HE STA may send an FTM frame in HE PPDU format in the 6 GHz band. An HE STA shall send an Ack frame in the same PPDU format as the soliciting PPDU when the soliciting PPDU a HE PPDU containing an FTM frame.

***TGax editor: Insert paragraph below as the 5th paragraph of 28.3.18 (HE transmit procedure) (present in D3.2 but removed in D3.3):***

(…existing texts)

Transmission of the PHY preamble may start if TIME\_OF\_DEPARTURE\_REQUESTED is false and shall start immediately if TIME\_OF\_DEPARTURE\_REQUESTED is true, based on the parameters passed in the PHY-TXSTART.request primitive.

If all of the following conditions are met:

* if dot11TODImplemented and dot11TODActivated are true or if dot11TimingMsmtActivated is true,
* the TXVECTOR parameter TIME\_OF\_DEPARTURE\_REQUESTED is true,

then the PHY shall issue a PHY-TXSTART.confirm(TXSTATUS) primitive to the MAC, forwarding the TIME\_OF\_DEPARTURE corresponding to the time when the first frame energy is sent by the transmitting port and TIME\_OF\_DEPARTURE\_ClockRate parameter within the TXSTATUS vector. If dot11TimingMsmtActivated is true, then the PHY shall forward the value of TX\_START\_OF\_FRAME\_OFFSET in TXSTATUS vector.

***TGax editor: Insert the row below in Table 28-1 as follows (present in D3.2 but removed in D3.3):***

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| --- |
| * TXVECTOR and RXVECTOR parameters
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| Parameter | Condition | Value | TXVECTOR | RXVECTOR |
|  | (…existing fields…) |
| TIME\_OF\_DEPARTURE\_REQUESTED | See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters). |
|  | (…existing fields…) |

***TGax editor: Insert the subclause 28.3.16.5 (Time of Departure accuracy) as follows (present in D3.2 but removed in D3.3):***

* + - 1. Time of Departure accuracy

The Time of Departure accuracy test evaluates TIME\_OF\_DEPARTURE against aTxPHYTxStartRMS and aTxPHYTxStartRMS against TIME\_OF\_DEPARTURE\_ACCURACY\_TEST\_THRESH as defined in Annex P with the following test parameters:

* MULTICHANNEL\_SAMPLING\_RATE is:

 sample/s, for a CH\_BANDWIDTH parameter equal to CBW20

 sample/s, for a CH\_BANDWIDTH parameter equal to CBW40

 sample/s, for a CH\_BANDWIDTH parameter equal to CBW80

 sample/s, for a CH\_BANDWIDTH parameter equal to CBW160 or CBW80+80

where

*fH* is the nominal center frequency in Hz of the highest channel in the channel set

*fL* is the nominal center frequency in Hz of the lowest channel in the channel set, the channel set is the set of channels upon which frames providing measurements are transmitted, the channel set comprises channels uniformly spaced across.

* FIRST\_TRANSITION\_FIELD is L-STF.
* SECOND\_TRANSITION\_FIELD is L-LTF.
* TRAINING\_FIELD is L-LTF windowed in a manner which should approximate the windowing described in 17.3.2.5 (Mathematical conventions in the signal descriptions) with TTR = 100 ns.
* TIME\_OF\_DEPARTURE\_ACCURACY\_TEST\_THRESH is 80 ns.

NOTE—The indicated windowing applies to the time of departure accuracy test equipment, and not the transmitter or receiver.