IEEE P802.11  
Wireless LANs

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| P802.11bk SA1 CRs | | | | |
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| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Jonathan Segev | Intel |  |  | [jonathan.segev@intel.com](mailto:jonathan.segev@intel.com) |
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Abstract

This submission proposes to address the following CIDs I-43, I-44, I-10, I-37 (total of 4 CIDs) based in Draft P802.11REVme\_D7.0, and Draft P802.11bk D3.0.

Revisions:

1. Rev 01 incorporating comments from discussion in the committee.
2. Rev 02 clarify concurrent FTM with separate MAC enteties and TPE of beacons and FTM being identical.
3. REV 03 incorporate changes from TG discussion.

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 TGbk Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

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

**The text preceded by “Discussion” is not part of the adopted changes.**

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| I-43 | 32.01 | 9.4.2.300 | The FTM frame action field was modified in 11bk and added an optional Transmit power envelope field.  The modification is such that legacy devices (11az-2022) as well as more recent devices (REVmf devices including the 11bk amendment) may observe the new field. The TPE is also present in Beacon/Probe Response frame. 1. However there is no text to clarify which of the two TPE values are used the one in the Beacon or the one in the FTM 2. Legacy 802.11az compliant STAs now become non-compliant as they are now behaving not in accordance with the spec. | Clarify that inclusion of the field is limited to 11bk 320 MHz assignment and that the field overrides the Beacon/Probe Rsp frame. | Revise.  Agree in principle, see detailed discussion in R3 of submission <https://mentor.ieee.org/802.11/documents?is_dcn=1986> below.  TGbk editor make changes as detailed in R3 of <https://mentor.ieee.org/802.11/documents?is_dcn=1986> as shown below. |
| I-44 | 36.19 | 11.21.6.3.3 | The amendment makes a Shall and a Should statements regarding inclusion of Transmit Power Envelope requiring it for SP and indoor SP APs acting as an RSTA. 3 issues:  1. This makes existing ISTA non standard compliant in response to not behave as expected as they were not designed to parse the TPE in the FTM Rsp,  2. APs that are RSTA and are compatible with 802.11az non standard compliant as they do not behave in accordance with the shall and should requirements.  3. Clarify what happens when the TPE in the Beacon Prob. Rsp does not correlate with the TPE in the FTM Rsp - which one take precedence. | Limit the behavior to 11bk STAs REVmf behavior for RSTA and ISTA for inclusion of TPE in the FTM and clarify ambiguity if TPE is included in both the Beacon and FTM Rsp. | Revise.  Agree in principle, see detailed discussion in R3 of submission <https://mentor.ieee.org/802.11/documents?is_dcn=1986> below.  TGbk editor make changes as detailed in R3 of <https://mentor.ieee.org/802.11/documents?is_dcn=1986> as shown below. |

**Discussion of CIDs I-43, I-44:**

**Summary:**

Some history: submission 11-23-393 added that based on some corner case scenario of the TPE.

It also added several shall statements that hold for both legacy and 11bk STAs making these non-standard compliant.

The following describes some of the issues:

**Making legacy devices non-standard compliant**

The current text indicates the TPE as optionally present in all variations of the FTM frame, this is unlike other optional fields such as FTM Parameters, Ranging Parameters and others which are limited to NTB/TB or EDCA based operation.

*“The Transmit Power Envelope field is optionally present. If present, it contains one or more Transmit Power Envelope elements as defined 9.4.2.160 (Transmit Power Envelope element).”*

Compared to:

*“The Ranging Parameters element is optionally present. It is present in an IFTM frame and its retransmissions, when negotiating non-TB ranging;”*

OR:

*“The Secure HE-LTF Parameters element is optionally present. It is present in an IFTM frame, if the IFTMR frame contained a Ranging Parameters element”*

OR:

*“The FTM Parameters field is optionally present. It is present in an IFTM frame and its retransmissions when negotiating EDCA based ranging”*

And supportive normative behavior:

“*If an RSTA is a standard power AP or an indoor standard power AP, the RSTA shall include at least one Transmit Power Envelope element in an FTM frame.”*

While for RSTA that are not indoor or standard power AP:

*“If an RSTA is neither a standard power AP nor an indoor standard power AP, the RSTA should include at least one Transmit Power Envelope element(s) in an FTM frame.”*

If the TPE is allowed to be included in all variants of the protocol, legacy devices are now expected to parse and behave in accordance with new functionality they don’t support, thus become non-standard compliant.

**Ambiguous expected behavior for new devices**

In addition to the legacy non-compliance issues, a separate issue is ambiguous expected behavior from new devices that supports the TPE in the FTM:

1. Can the TPE in the beacon be different than the TPE in the FTM frame?
2. What takes precedence? The TPE in the FTM or the Beacon?
3. What happens if a TPE is not included in the FTM? Should an ISTA wait for the beacon?

**Resolution:**

**TGbk editor in P802.11bk D3.0 change paragraph insertion** **in p.36 L.17 – 26 at the end of subclause 11.21.6.3.3 as follows:**

An unassociated ISTA that is capable of receiving a Transmit Power Envelope element as part of its FTM procedure shall set to 1 its TPE Update Capable subfield in the IFTMR frame.

An RSTA that is capable of transmiting a Transmit Power Envelope element as part of the FTM procedure shall respond with an IFTM with the TPE Update Capable field set to 1, if the IFTMR frame included a TPE Update Capable subfield set to 1.

An associated ISTA shall set the TPE Update Capable subfield to 0.

An RSTA that set the TPE Update Capable subfield to 1, shall include at least one Transmit Power Envelope element in IFTM frames and LMR frames. When one or more Transmit Power Envelope element is included in an IFTM or LMR frame, the Transmit Power Envelope elements shall be the same as the ones carried in the Beacon and other managemanget frames transmitted by the RSTA and shall be ordered based on the corresponding rules for the Transmit Power

Envelope element defined in 10.22.4 (Operation with the Transmit Power Envelope element).(#2017)

**TGbk editor make the following changes to REVme D7.0 P.2708 L.30 between the 5th and 6th paragraphs**

For EDCA based ranging where the value of the corresponding Format And Bandwidth field value that

indicates DMG or EDMG format, see Table 9-282, the ISTA shall indicate, in the Ranging Priority subfield of

the FTM Parameters field of the FTM Parameters element in the IFTMR frame, its ranging priority as

described in Table 9-279a. Otherwise, the Ranging Priority subfield of the FTM Parameters field of the FTM

Parameters element is reserved.

An unassociated ISTA that is capable of receiving a Transmit Power Envelope element as part of its FTM procedure shall set to 1 its TPE Update Capable subfield in the IFTMR frame.

An RSTA that is capable of transmiting a Transmit Power Envelope element as part of the FTM procedure shall respond with an IFTM with the TPE Update Capable field set to 1, if the IFTMR frame included a TPE Update Capable subfield set to 1.

An associated ISTA shall set the TPE Update Capable subfield to 0.

An RSTA that set the TPE Update Capable subfield to 1, shall include at least one Transmit Power Envelope element in FTM frames. When one or more Transmit Power Envelope element is included in an FTM frame, the Transmit Power Envelope elements shall be the same as the ones carried in the Beacon and other managemanget frames transmitted by the RSTA.

When the request was successful:

— The RSTA shall indicate, in the Format And Bandwidth field, a format and bandwidth that it

supports. The RSTA should indicate the same format and bandwidth in the Format And Bandwidth

field as that requested by the ISTA, if the RSTA supports this. The RSTA shall not assign a value

that indicates:

**TGbk editor make the following changes to REVme D7.0 P.1294 L.8-25 clause 9.4.2.166 FTM Parameters element**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2B6 | B7 | B8 B11 | B12B15 | B16 B23 | B24 B39 |
|  | Status  Indication | Value | Secure RTT Measurement/ ~~Reserved~~  TPE Update Capable | Number of Bursts Exponenent | Burst Duration | Min Delta FTM | Partial TSF Timer |
| Bits: | 2 | 5 | 1 | 4 | 4 | 8 | 16 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B40 | B41 | B42 | B43 B47 | B48 B49 | B50 B55 | B56 B71 |
|  | Partial TSF  Timer No  Preference | ASAP Capable | ASAP | FTM Per Burst | EDMG Ranging Priority | Format and Bandwith | Burst  Period |
| Bits: | 1 | 1 | 1 | 5 | 2 | 6 | 16 |

**Figure 9-723 – FTM Parameters field format**

**TGbk editor make the following changes to REVme D7.0 P.1294 L.53-58 clause 9.4.2.166 FTM Parameters element**

For secure EDMG ranging, the Secure RTT Measurement/TPE Update Capable subfield is set to 1 by an ISTA to request a

secure RTT measurement exchange between an ISTA and an RSTA; see 11.21.6.3.3 (Negotiation for TB

and non-TB ranging measurement exchange). The Secure RTT Measurement/TPE Update Capable subfield is set to 1 by an

RSTA to acknowledge a secure RTT measurement exchange, and to 0 otherwise. For EDCA based ranging of non-EDMG STAs, the Secure RTT Measurement/TPE Update Capable subfield is set to 1 by an ISTA to request an RSTA to include one or more Transmit Power Envelope element in the EDCA based measurement exchange between an ISTA and an RSTA , and to 0 otherwise.

**TGbk editor make the following changes to REVme D7.0 P.1554 L.512-40 clause 9.4.2.300 Ranging Parameters element**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 B6 | B7 | B8 B9 | B10B11 | B12 | B13 | B14 | B15 |
|  | Status  Indication | Value | I2R LMR Feedback | Reserved | Ranging Priority | R2I TOA Type | I2R TOA Type | R2I AOA  Request | I2R AOA Request |
| Bits: | 2 | 5 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B16 B21 | B22 | B23 | B24 B26 | B27B29 | B30 | B31 | B32 B34 | B35 B37 |
|  | Format And Bandwidth | Immediate R2I Feedback | Immediate I2R Feedback | Max I2R Repetition | Max R2I Repetition | TPE Update Capable | Reserved | Max R2I STS ≤ 80MHz | 160MHz Max R2I STS ~~≥ 80MHz~~ |
| Bits: | 6 | 1 | 1 | 3 | 3 | 1 | 1 | 3 | 3 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B38 B39 | B40 B41 | B42 B44 | B45 B47 | B48 B55 |
|  | Max R2I LTF Total | Max I2R LTF Total | Max I2R  STS ≤ 80 MHz | 160 MHz Max  I2R  STS ~~> 80 MHz~~ | BSS Color Information |
| Bits: | 2 | 2 | 3 | 3 | 8 |

**TGbk editor, insert the following paragraph following the note at the top of REVme P.1546 L.1-8 cluase 9.4.2.300 Ranging Parameters element:**

NOTE—The values of 0 to 7 contained in the Max I2R Repetition and Max R2I Repetition subfields are mapped to the

values 1 to 8 for the number of HE-LTF repetitions, respectively.

The TPE Update Capble subfield is set to 1 to request or indicate the LMR frames of the FTM session includes one or more Transmit Power Envelope element.

The Ranging Priority subfield of the Ranging Parameters field of the Ranging Parameters element in the

IFTMR frame contains the ISTA’s ranging priority request, which indicates the time sensitivity of a ranging

operation, and it is set according to Table 9-323 (Definition of the EDMG Ranging Priority subfield when

included in the IFTMR frame(11az)).

**TGbk editor, insert the following paragraph following the note at the top of REVme P.1699 L.13-26 cluase 9.6.7.49 LMR frame format:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  | Category | Public Action | Dialog Token | TOD | TOA | TOD Error | TOA  Error |
| Octets: | 1 | 1 | 1 | 6 | 6 | 1 | 1 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CFO Parameter | R2I NDP  Tx PWR | I2R NDP Target RSSI | Secure HE-LTF Parameters (optional) | AOA Feedback  (optional) | TPE  (optional) |
| Octets: | 1 | 1 | 1 | 6 | 6 | variable |

**Figure 9-1234—LMR frame Action field format**

**TGbk editor, insert the following paragraph following paragraph at REVme D7.0 P.1701 L.26 the end of clause 9.6.7.49 LMR frame format:**

If the the TPE field is present in an LMR frame, it contains a Transmit Power Envelope element as defined in 9.4.2.160 Transmit Power Envelope element

**TGbk editor in P802.11bk D3.0 P.89 delete lines 40-43.**

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| I-10 | 32.6 | 11.21.6.3.1 | Question, can an associated STA in EMLSR mode perform ranging measurement on more than one link - this statement seems to say that one FTM session has to be specific to one link, but can there be two sessions? One per link and how is that signalled? | As in comment | Reject.  See detailed discussion and information provided in R3 of submission <https://mentor.ieee.org/802.11/documents?is_dcn=1986> below. |

**Discussion:**

FTM frames are processed at the link level rather than at the MLD layer, this means the FTM is limited to that specific link refer to 802.11be D7.0

*“35.3.14 MLD individually addressed Management frame delivery*

*…This subclause describes rules for individually addressed management frame delivery by an MLD with the exception of the following frames:…*

* *Public Action LMR frame*
* *Public Action FTM frame*
* *Public Action FTM Request frame*
* *Protected Fine Timing frame”*

This limits the context at which an FTM operates to the link level.

Furthermore 11be specificies that:

*“Between an AP MLD and a non-AP MLD, the following individually addressed MMPDUs shall be intended for an MLD: …”* FTM management frames are not amongst these action frames.

FTM procedure instances are occurring between two MAC enteties, the commenter is correct that the text suggests an EMLSR STA may conduct an FTM procedure in parallel to another happening on another link, and following the EMLSR rules, e.g. data traffic. However, this other procedure will not be an FTM procedure since the MLME API does not support multi-FTM sessions with the same AP (same MAC address).

On a separate note, a MAC entity may establish concurrent FTM sessions with several different MAC enteties, if a single physical device (which is an EMLSR AP or not) includes several MAC enteties, an ISTA may maintain independent concurrent FTM sessions with them, refer to 802.11-2020 11.21.6.1.

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| I-37 | 84.6 | 11.21.6.4.8.3 | "The number of NSTS/NSS used in the passive TB ranging exchanges shall be less than or equal to 4." - shouldn't that requirement be in the negotiation? | As in comment | Reject.  See detailed discussion in R3 of submission <https://mentor.ieee.org/802.11/documents?is_dcn=1986> below. |

**Discussion:**

In passive ranging, there is no negotiation of PSTA with ISTA or RSTA. As a result, for interoperability to happen a minimal common denominator is required.

The accuracy benefit going from lower to higher NSTS is a diminishing return, with 4 antennas seems to be the preferred mainstream maximum rank.

The limitation regarding Passive TB number of antennas is an IEEE 802.11az limitation which is outside the scope of this amendment dealing with 320MHz only. The 802.11az presented this limit due to simplicity, expected product cost, alignment with existing profiles and more. A higher rank in NSTS/NSS of the AP would yield higher PSTA cost (e.g. memory buffer size for p-matrix decode) that take advantage of that.

802.11bk may add a mode for 320MHz only that is higher than the 4 antennas, however the already double the size BW will yield double the size memory footprint. Going to 8 NSTS would suggest quarupale of the memory footprint.