### **IEEE P802.11 Wireless LANs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Transmit Power Element for FTM procedure | | | | |
| Date: 2025-10-08 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | Email |
| Jonathan Segev | Intel corporation |  |  | [Jonathan.segev@intel.com](mailto:Jonathan.segev@intel.com) |
| Roy Want | Google |  |  | [roywant@google.com](mailto:roywant@google.com) |
| Ali Raissinia | Qualcomm |  |  | [alirezar@qti.qualcomm.com](mailto:alirezar@qti.qualcomm.com) |
| Christian Berger | NXP |  |  | [christian.berger@nxp.com](mailto:christian.berger@nxp.com) |

**Abstract**

Close to completion of IEEE 802.11bk lacking Transmit Power Envelope behavior was identified, and some modifications were made to allow an RSTA to transmit TPE, however in some usage models the ISTA is the channel anchor. This submission closes this gap as well as enable the RSTA and ISTA agreement on availability windows in NTB measurement exchange where the RSTA is a non-AP STA.

**Revisions:**

* Rev 00 - Initial version of the document.
* Rev 01 - Incorporating feedback.
* Rev 02 – adding co-authors
* Rev 03 – incorporate feedback following discussion in the TG

***TGme editor:***

***Please note Baseline are based on REVmf D1.0 and 802.11-2025.***

***Edits are expressed via Word track changes.***

***CIDs***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 6 | 1421 | 9.4.2.160 | The ranging mechanism using TPE does not support cases where the channel anchor is the ISTA. | Enable FTM Request frames and I2R LMR frames to carry the Transmit Power Envelope element. | **Reject**  Support of TPE in the FTM and LMR is part of 802.11bk which is not part of the current ballot scope. Its suggested the commenter will bring this comment to the next LB. |
| 40 | 2984 | 11.21.6.4.4 | In FTM NTB operation, the RSTA is required to be available at all times on channel for an incoming Ranging NDPA. This is a very hard to meet requirement which doesnt exists in all other FTM modes (EDCA, TB). | Enable a similar mechanism to that of TB operation that uses "TWT" like availability windowing for measurement exchange. | **Revise**  REVmf editor incorporate changes identified in <https://mentor.ieee.org/802.11/dcn/25/11-25-1474-03-000m-ftm-support-in-sta-to-sta-operation.docx> as shown below. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resolution:**  **REVmf editor, insert new acronyms to clause 3.4 in the appropriate alphabetical placement:**  3.4 Acronyms and abbreviations  PRAW Proximity Ranging Availability Window  NNW Next is Negotiation Window  **9.4.2.300 Ranging Parameters element**   1. Table 9-434—Ranging Subelement IDs for Ranging Parameters  |  |  |  | | --- | --- | --- | | Subelement ID | Name | Extensible | | 0 | Non-TB Specific subelement | Yes | | 1 | TB-specific subelement | Yes | | 2 | Secure LTF subelement | Yes | | 3 | 320 MHz Ranging subelement | Yes | | 4 | Proximity Ranging Availability subelement | Yes | | 5-220 | Reserved |  | | 221 | Vendor Specific |  | | 222-255 | Reserved |  |   **REVmf editor, insert the following paragraph at the end of 9.4.2.300 (Ranging Parameters element) to REVmf P802.11 D1.0 P.1693 L.40:**  The Proximity Ranging Availability subelement is included in the IFTMR and IFTM frames for non-TB FTM session negotiation with non-AP RSTA.  The format of the Proximity Ranging Availability subelement is as shown in Figure 9-1097a (Proximity Ranging Availability subelement format).   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | B0 B7 | B8 B15 | B16 B27 | B28 B29 | B30 B37 | B38 B39 | | Subelement ID | Length | Nominal Time | Meas Per PRAW | PRAW Duration | Reserved | | 8 | 8 | 12 | 2 | 8 | 2 |   **Figure 9-1097a Proximity Ranging Availability subelement format**  The PRAW Duration field is set to the duration of the PRAW in units of 1ms.  Meas Per PRAW field indicates the number of successful measurements per PRAW. The field is encoded as the number of measurements attempts per AW minus 1, e.g. value 0 indicates 1 measurement per PRAW, value 1 indicates 2 measurements attempts per PRAW etc.  **REVmf editor, make changes identified below to REVmf P802.11 D1.0 P.1908 L.44 figure 9-1352 as shown below:**  9.6.7.49 Location Measurement Report (LMR) frame format  The TOD Error field format is defined in Figure 9-1352 (TOD Error field format).   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | B0 B4 | B5 | B6 | B7 | |  | Max TOD Error Exponent | NNW | Reserved | TOD not continuous | | Bits: | 5 | 1 | 1 | 1 |   **Figure 9-1352 – TOD Error field format**  **REVmf editor, insert text identified below to REVmf P802.11 D1.0 P.1909 between L.22 and L.24 as shown below:**  The maximum errors in the TOD and TOA values are represented using the function defined in Equation (9-  15).    (9-15)  where  *F* is the Max Error Exponent  *Emax* is the maximum TOD or TOA error, respectively, in units of picoseconds  The Max TOD Error Exponent subfield contains an upper bound for the error exponent in the value  specified in the TOD field.  The TOD Not Continuous subfield indicates that the TOD value is with respect to a different underlying  time base than the last transmitted TOD value. It is set to 1 when a discontinuity is present. Otherwise, it is  set to 0.  The NNW field is used when the RSTA and ISTA are non-AP STAs and reserved in other cases. It is set to 0 to indicate the next PRAW is a range measurement window where both ISTA and RSTA are available to the duration of the currently negotiated PRAW.  The NNW field is set to 1 to indicate the ISTA and RSTA are available at the start of next PRAW to complete FTM session modification and execution of a first modified PRAW.  **REVmf editor, insert a new clause to REVmf D1.0 at the end 11.21.6.4.4 as shown below:**  11.21.6.4.4 Non-TB ranging measurement exchange  11.21.6.4.4.4 Operation with non-AP RSTA  When an FTM session is negotiated between two non-AP STAs, the ISTA and RSTA shall negotiate mutual availability of the medium by including a Proximity Ranging Availability subelement in the Ranging Parameters element. The ISTA and RSTA negotiation includes three parameters: Nominal Time, Meas Per PRAW and PRAW Duration. PRAW are defined by Nominal Time and PRAW Duration that coordinate the start time and duration of the continues availability to execute measurements. Meas Per PRAW is the negotiated number of successful measurements attempts per PRAW.  During PRAWs the ISTA and RSTA devices shall be available to exchange N successful FTM measurements instances where N equals the negotiated Meas Per PRAW.  Once FTM negotiation is complete, the non-AP STA shall continue channel presence until completion of the first successful measurement instance, which sets the beginning of the first PRAW, and nominal time after, the scheduling of the second PRAW. The STAs will perform Meas Per PRAW successful measurements inclusive of the first successful measurement during this first PRAW (see figure 11-63a First PRAW In Non-AP STAs FTM Exchange).    Figure 11 – 63a First PRAW In Non-AP STAs FTM Exchange  Figure 11-63b (Example of FTM measurement instances executed in steady state PRAWs) shows three consecutive PRAW instances (i.e. PRAW(n), PRAW(n+1) and PRAW(n+2)). PRAW(n+1) shows two successful measurement instances. The start time of PRAW(n+2) is Nominal Time from 1st successful measurement of PRAW(n) which happened to occur in the middle of PRAW(n+1). Within each PRAW instance one or more non-TB measurement sequences occur.    Figure 11-63b Example of FTM measurement instances executed in steady state PRAWs  During PRAWs the ISTA and RSTA devices shall be available to exchange M successful FTM measurements instances, where M equals the negotiated Meas Per PRAW.  Each PRAW starts with the first successful measurement of the associated PRAW and ends PRAW Duration later. |
| **REVmf editor, insert a new clause to REVmf D1.0 at the end 11.21.6.5.2** **as shown below:**  11.21.6.5.2 Non-TB Ranging Parameter modification with non-AP RSTA  When an FTM session is negotiated between two non-AP STAs, the ISTA and RSTA may modify the schedule during which measurement frames may be exchanged to adapt the range refresh rate to the upper layer’s time specific requirements. Both ISTA and RSTA may initiate changes to the FTM session including the AWs using FTM parameter modification. An ISTA and/or RSTA may trigger FTM parameter modification by setting the NNW field in their respective LMR’s TOD Error field to True on all measurement instances during a specific PRAW. If no successful measurements occur during instance n of the PRAWs, then PRAW(n+1) shall refer to the start of the PRAW(n) scheduling.  Upon successful measurement instance with the NNW field set to True(refer to PRAW(n) in figure below), the STAs shall continuously be available on channel starting nominal time away from this first successful measurement. The ISTA and RSTA shall then execute FTM session negotiation as defined in 11.21.6.5 FTM parameter modification. The ISTA and RSTA will continue channel presence until completion of the FTM negotiation and completion of the first successful measurement instance, which sets the beginning of the first availability window in the modified session, and nominal time after, the scheduling second availability window in the modified session. The STAs will perform Meas Per PRAW measurements inclusive of the first successful measurement during this first modified PRAW.    Figure 11-75a Example of PRAW timing Modification  Figure 11-75a shows an example of an FTM session where in PRAW(n), the R2I LMR and/or I2R LMR, the NNW field was set to True. |