IEEE P802.11
Wireless LANs

|  |
| --- |
| CR for Passive Location |
| Date: 2018-11-12 |
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|  |  |  |  |  |

**Abstract**

This submission proposes resolutions of comments received from TGaz CC28.

(The proposed change is based on TGaz Draft 0.5.3)

* CIDs: 68, 101, 107, 108, 109, 117, 118, 119, 120, 124, 125, 126,127, 129, 130, 131, 226, 227, 458, 459, 460, 461, 463 (passive location part), 464, 465, 466, 467 (passive location part), 534

***Note: We should Add/modify subsection under Section 6.3 to support the MLME SAP interface for passive location ranging.* Don’t think we have a subsection here to deal even with TB-ranging so we should add that.**

***TGaz Editor: Modify Table 1-Table xxxx as indicated below:***

**9.3.1.23 Trigger frame format**

…

**9.3.1.23.9 Location variant**

1. —Table xxxx — Location Trigger subtype of the Location Trigger Dependent Common Info Field

|  |  |
| --- | --- |
| Trigger Subtype field value | Description |
| 0 | HEz Poll |
| 1 | HEz Uplink Sounding |
| 2 | HEz LMR |
| 3 | Location Negotiation |
| 4 | ~~HEz~~ Passive Location ~~Uplink~~ Sounding |
| 5-15 | Reserved |

***TGaz Editor: Modify the text in Section ‘9.3.1.23.9.4 HEz Passive Uplink Sounding (PUS) Sub-variant’***

***as indicated below:***

9.3.1.23.9.4 ~~HEz~~ Passive Location ~~Uplink~~ Sounding ~~(PUS)~~ Sub-variant

The Passive Location Sounding sub-variant Location Trigger frame follows the definition of the TB Ranging Sounding Location Trigger frame sub-variant, with a Trigger Subtype field value set to 4 and the RA field is set to the broadcast address.

~~The Trigger Dependent User Info subfield is not present for the HEz PUS sub-variant Location Trigger frame.~~

~~The RA field of the HEz PUS sub-variant Location Trigger frame is set to the MAC address of the recipient ISTA.~~

~~The CS Required subfield in the Common Info field is set as described in 27.5.3.5 (UL MU CS mechanism).~~

~~The UL BW subfield in the Common Info field indicates the total PPDU bandwidth, and is defined in Table 9-25c (UL BW subfield encoding).~~

~~The UL Length, More TF, MU-MIMO LTF Mode, UL STBC, LDPC Extra Symbol Segment, UL Packet Extension, UL Spatial Reuse, Doppler and UL HE-SIG-A2 Reserved subfields in the Common Info field are reserved.~~

~~The GI And LTF Type, Number Of HE-LTF Symbol and Midamble Periodicity, AP TX Power subfield in the Common Info field are TBD.~~

~~The AID12 subfield in the User Info field carries the 12 LSBs of either the AID of the associated ISTA or the RID of the unassociated ISTA for which the User Info field is intended.~~

~~The RU Allocation, UL FEC Coding Type, UL MCS, UL DCM and SS Allocation fields in the User Info field are reserved.~~

~~The UL Target RSSI field in the User Info field is TBD.~~

***TGaz Editor: Change Table 9-31 (Beacon frame body) as follows:***

##### 9.3.3.3 Beacon frame format

…

**Table 9-31 – Beacon frame body**

|  |
| --- |
|  |
| **Order** | **Information** | **Notes** |
| 1 | Timestamp |  |
| … | … | … |
| 71 (M40) | Max Channel SwitchTime | The Max Channel Switch Time element is optionally presentwhen a Channel Switch Announcement or an Extended ChannelSwitch Announcement element is also present. |
| ~~Last~~ANA | ~~Vendor Specific~~Passive Location Ranging Availability Window | ~~One or more vendor-specific elements are optionally present. These elements follow all other elements.~~The Passive Location Ranging Availability Window element is optionally present if dot11PassiveLocationRangingResponderActivted is true and a Passive Location Ranging Availability Window is present. |
| Last | Vendor Specific | One or more vendor-specific elements are optionally present. These elements follow all other elements. |

***TGaz Editor: Edit Table ‘Table 7—Table 9-283—Extended Capabilities element’ as indicated below:***

**9.4.2.26 Extended Capabilities element**

**…**

1. —Table 9-283—Extended Capabilities element

|  |  |  |
| --- | --- | --- |
| Bits | Information | Notes |
| <ANA> | Secure LTF Support | A STA sets the Secure LTF Support field to 1 when dot11SecureLTFImplemented is true. Otherwise, the STA sets the Secure LTF Support field to 0. See 11.22.6.4a (Secure LTF Measurement Exchange Protocol). |
| <ANA> | ~~HEz Passive Range Measurement Support~~ Passive Location Ranging Responder Measurement Support | A STA sets the ~~HEz Passive Range Measurement Support~~ Passive Location Ranging Responder Measurement Support field to 1 when ~~dot11PassiveRangeMeasurementImplemented~~ dot11PassiveLocationRangingResponderActivated is true. Otherwise, the STA sets the ~~HEz Passive Range Measurement Support~~ Passive Location Ranging Responder Measurement Support field to 0. See ~~11.22.6.4.8~~ 11.22.6.4.9 (Measurement Exchange in ~~HEz~~ Passive ~~Range~~ Location Ranging mode). |
| <ANA> | Passive Location Ranging Inititiator Measurement Support | A STA sets the Passive Location Ranging Initiator Measurement Support field to 1 when dot11PassiveLocationRangingInitiatorActivated is true. Otherwise, the STA sets the Passive Location Ranging Initiator Measurement Support field to 0. See 11.22.6.4.9 (Measurement Exchange in Passive Location Ranging mode). |

***TGaz Editor: Insert Section 9.4.2.nnn as follows:***

*Insert the following sub-clause in section 9.4.2 as shown below:*

**9.4.2.nnn Passive Location Ranging Availability Window element**

The Passive Location Ranging Availability Window element, defined in Figure 9-709b, is used to announce the availability window in which Passive Location Ranging is being performed to enable STAs to listen in to the there occurring Passive Location Ranging exchanges in order to estimate their location. It is carried within the beacon of an AP STA. Note: Though the primary objective with this announcement is to enable STAs not actively participating in the Passive Location Ranging exchanges to listen in.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element Id | Element Length | Element ID Extension | Availability Window |
| octets: | 1 | 1 | 1 | 5 |

Figure 9-709b - Direction Measurement Results Element

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1.

The Availability Window field is defined in Figure 9-709c.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 B21 | B22 B28 | B29 B36 | B37 B40 | B41 B47 |
|  | Passive Location Availability Window Partial TSF  | Duration | Periodicity | BW | Reserved |
| bits: | 22 | 7 | 8 | 4 | 7 |

Figure 9-709c – Availability Window field

The Passive Location Availability Window Partial TSF Timer sub-field in the Availability Window field indicates what the partial value of the Responder’s TSF timer will be at the start of the Availability Window for the Passive Location Ranging. The allowed value to give for the Passive Location Availability Window Partial TSF is limited to be less than 62/64 of 65 536 TUs (<63 488 TUs) ahead of the TSF time at which the frame containing the Availability Window field is transmitted and 1/64 of 65 536 TUs earlier (inclusive) (≥1024 TUs).

The Passive Location Availability Window Partial TSF timer value is defined as follows: from the 64 bit TSF timer, remove the most significant 41 bits and the least significant bit. Thus the units of the Passive Location Availability Window Partial TSF timer is 10us, and its max value is about 41.9 seconds.

The Duration subfield indicates the length of the Passive Location Ranging availbility window in unit of 100 us. (Giving it a value from 0 to ~12.8 ms).

The Periodicity subfield in the Availability Window Information subfield indicates the periodicity of the Availability Window assigned to the ISTA in units of the value of the Beacon Interval field in the most recent beacon sent by the RSTA. (Giving it a value from 0 to ~25.6 s when the beacon interval is 100 TU)

The BW subfield, defined in Table 302b, indicates the nominal BW used for the transmissions in the Passive Location Ranging availbility window. Depending on the medium availability smaller bandwidth may be used for the exchanged frames.

|  |  |  |
| --- | --- | --- |
|  | BW subfield value |  BW in MHz |
|  | 0 | 20 |
|  | 1 | 40 |
|  | 2 | 80 |
|  | 3 | 80+80 or 160 |
|  | 4-15 | Reserved |
|  |  |  |  |  |

Table 302b – BW subfield for Availability Window field in the Passive Location Ranging Availability Element

***TGaz Editor: Add row as shown below to Table 9-87 (Element IDs), with the appropriate section referneces, as indicated, and Element ID numbering:***

|  |
| --- |
| * Element IDs
 |
| Element | Element ID | Element ID Extension | Extensible | Fragmentable(11ai) |
| … | … | … | … | … |
| Passive Location Ranging Availability Window element (see 9.4.2.nnn) | 255 | ANA | TBD | NO |
| ISTA Passive Location Measurement Report (see 9.4.2.nnn) | 256 | ANA | TBD | YES |
| RSTA Passive Location LMR (see 9.4.2.nnn) | 257 | ANA | TBD | YES |
| Passive Location LCI Table (see 9.4.2.nnn) | 258 | ANA | TBD | YES |

***TGaz Editor: Edit Section ‘9.6.7.38 ISTA Passive Location Measurement Report frame format’ as indicated below:***

**9.6.7.38 ISTA Passive Location Measurement Report frame format**

The ISTA Passive Location Measurement Report frame is an Action No Ack frame of category Ranging. The ISTA Passive Location Measurement Report frame is used to support the passive location ranging mechanisms of the FTM procedure described in 11.22.6 (Fine timing measurement (FTM) procedure). The format of the ISTA Passive Location Measurement Report Action field is shown in Figure 9-xxx (ISTA Passive Location Measurement Report Action field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Category | Public Action | Passive Location Dialog Token | ISTA Passive Location Measurement Report |
| Octets: | 1 | 1 | 1 | Variable |

1. **—Figure 9-xxx ISTA Passive Location Measurement Report Action field format**

The Category field is defined in 9.4.1.11 (Action field).

The Public Action field is defined in 9.6.8.1 (Public Action frames).

~~The Dialog Token field is TBD~~

If the Passive Location Polling-Sounding-Reporting triplet being reported on is the current Polling-Sounding-Reporting triplet, then the Passive Location Dialog Token field is set to 1, else it is set to the value of the Passive Location Dialog Token corresponding to the Passive Location Polling-Sounding-Reporting triplet reported on. If the ISTA was not able to receive the Passive Location Dialog Token it sets the reported Passive Location Dialog Token to 0.

The ISTA Passive Location Measurement Report field is ~~TBD~~ defined in Section 9.4.2.nnn titled ‘ISTA Passive Location Measurement Report’.

***TGaz Editor: Insert Section ‘9.4.2.nnn ISTA Passive Location Measurement Report’ as indicated below:***

*Insert the following sub-clause in section 9.4.2 as shown below:*

**9.4.2.nnn ISTA Passive Location Measurement Report element**

The ISTA Passive Location Measurement Report element, defined in Figure 9-yyy, is used to convey measurement results and associated parameters from an ISTA to the RSTA in a Passive Location ranging exchange.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element Id | Element Length | Element ID Extension | CFO | N Time Stamp Measurement Reports | Time Stamp Measurement Reports |
|  | Octets: | 1 | 1 | 2 | 1 | variable |

Figure 9-yyy – ISTA Passive Location Measurement Report Element

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1.

The CFO element indicates the reporting ISTAs carrier frequency offset with respect to the RSTA. The CFO element is a signed integer in twos-complements format indicating the CFO in units of 0.5 ppm.

The N Time Stamp Measurement Reports field is an unsigned integer indicating the number of Time Stamp Measurement Reports.

The N Time Stamp Measurement Reports field is an unsigned integer indicating the number of Time Stamp Measurement Reports.

Time Stamp Measurement Reports field contains one or more Time Stamp Measurement Report fields defined as in Figure 9-zzz.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0  | B1  | B2 B49 | B50 B57 | B66 B81 | B82 B87 |
|  | Type | Valid | Time-Stamp | Time-Stamp Error | RID | Reserved |
| bits: | 1 | 1 | 48 | 16 | 16 | 6 |

Figure 9-zzz – Time Stamp Measurement Report field

The Type subfield is set to 0 if the reported time-stamp is a TOD time-stamp and is set to 1 if the reported time stamp is a TOA time-stamp.

The Time-Stamp subfield conatins a TOD or TOA time-stamp.

The TOD time-stamp represents the time, with respect to the ISTA’s time base, at which the start of the preamble of the NDP in question appeared at the transmit antenna connector.

The TOA time-stamp represents the time, with respect to the ISTA’s time base, at which the start of preamble of the NDP in question arrived at the receive antenna connector.

The Time-Stamp subfield contains the TOD or TOA time-stamp, is in units of pico-seconds.

The Time-Stamp Error subfield indicates the absolute value of the estimated max error.

The Time Stamp Error field is structured as shown in 9-aaa (Format of the Time-Stamp Error field).

|  |  |  |
| --- | --- | --- |
|  | B0 B4 | B5 B15 |
|  | Max Error Exponent | Reserved |
| Bits: | 5 | 11 |

**Figure 9-aaa – Format of Time-Stamp Error field**

The maximum errors  in the time-stamp values are represented using the function defined in Equation (9-x).

(9-x)

where

*F* is the Max Error Exponent

*Emax* is the maximum time-stamp error, respectively, in units of picoseconds

The RID subfield contains the ranging AID of the STA that transmitted the NDP in question.

***TGaz Editor: Insert Section ‘9.6.7.nnn Primus RSTA Broadcast Passive Location Measurement Report frame format’ as shown below:***

*Insert the following sub-clause in section 9.6.7 as shown below:*

**9.6.7.nnn Primus RSTA Broadcast Passive Location Measurement Report frame format**

The Primus RSTA Broadcast Passive Location Measurement Report frame is an Action No Ack frame of category Ranging. The Primus RSTA Broadcast Passive Location Measurement Report frame is used to support the passive location ranging mechanisms of the FTM procedure described in 11.22.6 (Fine timing measurement (FTM) procedure). The format of the Primus RSTA Broadcast Passive Location Measurement Report Action field is shown in Figure 9-fff (Primus RSTA Broadcast Passive Location Measurement Report Action field format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Category  | Public Action | Passive Location Dialog Token | Current Passive Location LCI Table Number | Passive Location LCI Table Countdown Info | RSTA Passive Location LMR | Passive Location LCI Table (optional) |
| Octets: | 1 | 1 | 1 | 1 | 1 | Variable | Variable |

1. —Figure 9-fff Primus RSTA Broadcast Passive Location Measurement Report Action field format

The Category field is defined in 9.4.1.11 (Action field).

The Public Action field is defined in 9.6.8.1 (Public Action frames).

The Passive Location Dialog Token field contains the Passive Location Dialog Token associated with the current Passive Location Polling-Sounding-Reporting triplet. The RSTA manages assigning Passive Location Dialog Tokens for the Passive Location Polling-Sounding-Reporting triplet. The Passive Location Dialog Token cannot be set to zero or one though as these value is reseved for use by ISTAs to report that they don’t know the value of the Passive Location Dialog Token or that their Passive Location Ranging measurements reported stem from the current Passive Location Polling-Sounding-Reporting triplet.

The Current Passive Location LCI Table Number field contains the number of the current valid Passive Location LCI Table.

The Passive Location LCI Table Countdown Info field contains two subfields as shown in Figure 9-rrr ‘Passive Location LCI Table Countdown field’.

|  |  |  |
| --- | --- | --- |
|  | B0  | B1 B7 |
|  | New LCI Table | Passive Location LCI Table Countdown |
| Bits: | 1 | 7 |

**Figure 9-rrr – Passive Location LCI Table Countdown field**

The subfield New LCI Table is 0 if the current LCI table and LCI table to be transmited at the end of the countdown are the same, else it is 1.

The Passive Location LCI Table Countdown subfield is an index pointing the the next Passive Location Ranging Availability window where the Passive Location LCI table will be contained in the Primus RSTA Broadcast Passive Location Measurement Report frame. The current availability window has index zero, the next one has index 1, and so on.

The RSTA Passive Location LMR field is defined in Section 9.4.2.nnn titled ‘RSTA Passive Location LMR’.

The Passive Location LCI Table field is defined in Section 9.4.2.nnn titled ‘Passive Location LCI Table Report’.

***TGaz Editor: Insert Section ‘9.4.2.nnn RSTA Passive Location LMR as shown below:***

*Insert the following sub-clause in section 9.4.2 as shown below:*

**9.4.2.nnn RSTA Passive Location LMR element**

The RTSA Passive Location LMR element, defined in Figure 9-sss, is used to broadcast measurement results and associated parameters from an RSTA to the STAs that want to use this information.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element Id | Element Length | Element ID Extension | Passive Location Dialog Token | N Time Stamp Measurement Reports | Time Stamp Measurement Reports |
|  | Octets: | 1 | 1 | 1 | 1 | variable |

Figure 9-sss – RSTA Passive Location Measurement Report Element

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1.

The Passive Location Dialog Token field is set to the Passive Location Dialog Token value corresponding to the Passive Location Ranging Polling-Sounding-Reporting triplet reported on.

The N Time Stamp Measurement Reports field is an unsigned integer indicating the number of Time Stamp Measurement Reports.

Time Stamp Measurement Reports field contains one or more Time Stamp Measurement Report fields defined as in Figure 9-zzz.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0  | B1  | B2 B49 | B50 B65 | B66 B81 | B82 B87 |
|  | Type | Valid | Time-Stamp | Time-Stamp Error | RID | Reserved |
| bits: | 1 | 1 | 48 | 16 | 16 | 6 |

Figure 9-zzz – Time Stamp Measurement Report field

The Type subfield is set to 0 if the reported time-stamp is a TOD time-stamp and is set to 1 if the reported time stamp is a TOA time-stamp.

The TOD timestamp that represents the time, with respect to the RSTA’s time base, at which the start of the preamble of the NDP in question appeared at the transmit antenna connector.

The TOA time-stamp represents the time, with respect to the RSTA’s time base, at which the start of preamble of the NDP in question arrived at the receive antenna connector.

The Time-Stamp subfield contains the TOD or TOA time-stamp, is in units of pico-seconds.

The Time-Stamp Error subfield is structured as shown in 9-aaa (Format of the Time-Stamp Error field).

|  |  |  |
| --- | --- | --- |
|  | B0 B4 | B5 B15 |
|  | Max TOD Error Exponent | Reserved |
| Bits: | 5 | 11 |

**Figure 9-aaa – Format of Time-Stamp Error field**

The maximum errors  in the Time-Stamp values are represented using the function defined in Equation (9-x).

(9-x)

where

*F* is the Max Error Exponent

*Emax* is the maximum Time-Stamp error, respectively, in units of picoseconds

The RID subfield contains the ranging AID of the STA that transmitted the NDP in question.

***TGaz Editor: Insert Section ‘9.4.2.nnn Passive Location LCI Table as shown below:***

*Insert the following sub-clause in section 9.4.2 as shown below:*

**9.4.2.nnn Passive Location LCI Table element**

The Passive Location LCI Table Report element, defined in Figure 9-ggg, is used by an RSTA to broadcast LCI data for the ISTAs participating in its Passive Location Ranging exchanges.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element Id | Element Length | Element ID Extension | Passive Location LCI Table Number | RSTA LCI | Number of ISTA LCI Reports | ISTA LCI Reports |
|  | Octets: | 1 | 1 | 1 | Variable | 1 | Variable |

Figure 9-ggg - Passive Location LCI Table Report Element

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1.

The RSTA LCI field contains a Measurement Report element with Measurement Type field equal to LCI (see Table 9-118 (Measurement Type field definitions for measurement reports)), which indicates the LCI of the transmitting RSTA and includes the Z and Usage Rules/Policy subelement or indicates an unknown LCI (see 11.22.6.7 (LCI and Location Civic retrieval using FTM procedure)). The Late, Incapable and Refused bits in the Measurement Report Mode field are set

to 0.The Co-Located BSSID List subelement is present in the Measurement Report element with

Measurement Type field equal to LCI, when there is at least one other BSS which is co-located with the

reporting BSS.

The ISTA LCI Reports field contains Number of ISTA LCI Reports ISTA LCI Report field fields defined as in Figure 9-hhh.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ISTA RID | ISTA MAC ADDRESS | ISTA Relative Latitude | ISTA Relative Longitude | ISTA Relative Elevation |
| octets: | 2 | 6 | 2 | 2 | 2 |

Figure 9-hhh – ISTA LCI Report field

The ISTA RID subfield contains the ranging ID of the ISTA reported on.

The ISTA MAC ADDRESS subfield contains the MAC address of the ISTA reported on.

The ISTA Relative Latitude subfield contains a signed integer in two’s complement format indicating the latitude offset of the ISTA reported on in relation to the latitude of the RSTA, in units of TBD.

The ISTA Relative Longitude subfield contains a signed integer in two’s complement format indicating the longitude offset of the ISTA reported on in relation to the longitude of the RSTA, in units of TBD.

The ISTA Relative Elevation subfield contains a signed integer in two’s complement format indicating the elevation offset of the ISTA reported on in relation to the elevation of the RSTA, in units of TBD.

***TGaz Editor: Insert Section ‘9.6.7.mmm Secundus RSTA Broadcast Passive Location Measurement Report frame format’ as shown below:***

*Insert the following sub-clause in section 9.6.7 as shown below:*

**9.6.7.mmm Secundus RSTA Broadcast Passive Location Measurement Report frame format**

The Secundus Broadcast RSTA Passive Location Measurement Report frame is an Action No Ack frame of category Ranging. The Secundus RSTA Broadcast Passive Location Measurement Report frame is used to support the passive location ranging mechanisms of the FTM procedure described in 11.22.6 (Fine timing measurement (FTM) procedure). The format of the Secundus RSTA Broadcast Passive Location Measurement Report Action field is shown in Figure 9-ggg (Secundus RSTA Broadcast Passive Location Measurement Report Action field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Category  | Public Action | Number of ISTA Passive Location Measurement Reports | ISTA Passive Location Measurement Reports |
| Octets: | 1 | 1 | 1 | Variable |

1. —Figure 9-ggg Secundus RSTA Broadcast Passive Location Measurement Report Action field format

The Category field is defined in 9.4.1.11 (Action field).

The Public Action field is defined in 9.6.8.1 (Public Action frames).

The Number of ISTA Passive Location Measurement Reports field indicates the number of following Passive Location ISTA to RSTA LMR report fields.

The ‘ISTA Passive Location Measurement Reports’ field contains ‘Number of ISTA Passive Location Measurement Reports’ ‘ISTA Passive Location Measurement Report elements’. The ‘ISTA Passive Location Measurement Reports element’ is defined in Section 9.4.2.nnn ISTA Passive Location Measurement Report.

***TGaz Editor: Edit ‘Figure 9-610d HEz Specific Parameters subelement format’ as follows:***

9.4.2.278 Ranging Parameters

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Subelement ID (1) | Length | Availability Window | Ranging ID | Response | Passive Location Ranging | Reserved | MaxToAAvailableExp () | BSS Color |
| Octets | 8 | 8 | TBD | 16 | 1 | 1 | ~~3~~2 | 4 | 8 |

1. —Figure 9-610d HEz Specific Parameters subelement format

***TGaz Editor: Edit the text following ‘Figure 9-610d HEz Specific Parameters subelement format’ that defines the parameters in the ‘HEz Specific Parameters subelement’ as follows:***

The Element ID and Length fields are defined in 9.4.3 (Subelements).

The definition of Availability Window is TBD

The Ranging ID is the same as the AID if the initiator is associated with the responder; and is similar to AID and is assigned by the responder to identify the unassociated initiator. The Ranging ID and the AID are derived the same space and are non-conflicting.

The Passive Location Ranging field is set to 1 by the Initiator to request Passive Location Ranging operation, otherwise it is set to 0.

The Passive Location Ranging field is set to 1 by the Responder to grant Passive Location Ranging operation, otherwise it is set to 0.

The Response field is either set to 0 or 1, indicating Immediate or Delayed response. If the Response field is set to Immediate then the ToD andToA values included in the corresponding Location Measurement Report (LMR) frame are from the current range measurement; and if the Response field is set to Delayed then the ToD and ToA values in the corresponding LMR frame are from the previous range measurement.

The MaxToAAvailableExp field is the same as described under VHTz Specific subelement.

The BSS Color field is an unsigned integer in the range 1 to 63 whose value is set to the same BSS Color value contained in the HE Operation element that an RSTA transmit.

***TGaz Editor: Edit Section ‘11.22.6.1 Overview’ as indicated below:***

11.22.6.1 Overview

*Modify the following paragraphs of Clause 11.22.6.1 as shown below:*

The FTM procedure allows a STA to determine its distance and (for DMGz and EDMGz STAs) its direction to or from another STA. There is also a mode of the FTM procedure that allows a STA to determine its differential distance to pairs/sets of other STAs. In order for a STA to obtain its location, the STA may perform ~~this~~ these procedures with multiple STAs whose locations are known.

An FTM session is an instance of a FTM procedure between an initiating STA and a responding STA along with the associated scheduling and operational parameters of that ~~instance (see 9.4.2.166 (Fine Timing Measurement Parameters element))~~.(see 9.4.2.168 (Fine Timing Measurement Parameters element)) and 9.4.2.246 (Ranging Parameters element)). An FTM session is composed of a negotiation, measurement exchange and termination. ….

A responding STA (RSTA) might be required to establish overlapping FTM sessions with a large number of initiating STAs (e.g., an AP providing measurements to STAs at a mall or a store). On the other hand, an initiating STA (ISTA) might have multiple ongoing FTM sessions on the same or different channels with different responding STAs, while being associated with an AP for the exchange of data or signaling.

*Insert the following paragraphs of Clause 11.22.6.1 as shown below:*

In order to obtain an ISTA to RSTA RTT (Round Trip Time) there are two basic scheduling methods: RSTA centric scheduling and ISTA centric scheduling. In RSTA centric scheduling the RSTA assigns the ISTA a set of known availability time windows during which measurements occur, and the RSTA has full control of the measurement timing. In ISTA centric scheduling the ISTA initiates a measurement based on loose scheduling limitations provided by the RSTA.

A variant of the RSTA centric scheduling is part of a passive location ranging procedure that enables a STA that to, by only listen to the ranging exchanges, measure differential distances to pairs/sets of STAs and use this information to estimate its location.

The measurement exchange is one of the following:

The measurement exchange is one of the following:

1. FTM Measurement Exchange: Exchange of Fine Timing Measurement frames in bursts
2. VHTz Ranging: a sequence of uplink Null Data Packet Announcement, uplink Null Data Packet, downlink Null Data Packet and downlink Location Measurement Report
3. HEz Ranging: Multiuser exchange of downlink poll, multiuser uplink poll response, downlink trigger, multiuser uplink NDPA, multiuser uplink NDP, downlink NDP and downlink Location Measurement Report to multiple STAs
4. Passive Location Ranging: Same as the HEz Ranging apart from some exceptions. See Section 11.22.6.4.9.
5. DMGz Ranging: it shall set the DMG Range Measurement field of the Extended Capabilities element to 1. Otherwise it shall set the Multi User Range Measurement field of the Extended Capabilities element to 0. A STA that additionally supports Direction Measurement shall include a DMG Direction Measurement Capabilities field in the DMG Capabilities element and set one of the first 4 subfields of this field to 1
6. eDMGz Ranging, it shall set the EDMG Range Measurement field of the Extended Capabilities element to 1. Otherwise it shall set the Multi User Range Measurement field of the Extended Capabilities element to 0. A STA that additionally supports Direction Measurement shall include a DMG Direction Measurement Capabilities field in the DMG Capabilities element and set one of the first 4 subfields of this field to 1.

Sequences (b), (c), (d) and (e) above are referred to as 802.11az ranging protocols in this specification.

*Insert the following paragraphs of Clause 11.22.6.1 as shown below:*

For DMG and EDMG, an FTM session shall be preceded by a First Path Beamforming Training as described in 10.39.9.6 First Path Beamgorming Training.

*Insert the following sub-clause header, 11.22.6.1.1 between the two paragraphs in 11.22.6.1:*

*“A responding STA (RSTA) might be required to establish overlapping FTM sessions with a large number of initiating STAs (e.g., an AP providing measurements to STAs at a mall or a store). On the other hand, an initiating STA (ISTA) might have multiple ongoing FTM sessions on the same or different channels with different responding STAs, while being associated with an AP for the exchange of data or signaling.”*

***TGaz Editor: Insert Section 11.22.6.1.*3 RSTA centric Scheduling for Passive Location Ranging operation overview *as follows:***

*Insert the following sub-clause in section 11.22.6.1 as shown below:*

**11.22.6.1.3 RSTA centric Scheduling for Passive Location Ranging operation overview**

The RSTA centric Scheduling for Passive Location Ranging operation operates as the RSTA centric Scheduling for HEz Ranging operation described in Section 11.22.6.1.1. The availability window is here referred to as a Passive Location Ranging Availability window. The RSTA announces the schedule for the Passive Location Ranging Availability window, assuming it is present, in every beacon frame.

***TGaz Editor: Edit Section ‘11.22.6.2 FTM capabilities’ as indicated below:***

**11.22.6.2 FTM capabilities**

If the STA in which dot11FineTimingMsmtRespActivated is true or dot11FineTimingMsmtInitActivated is true supports:

…

~~(e) HEz Passive Ranging, it shall set the HEz Passive Range Measurement Support field of the Extended Capabilities element to 1. Otherwise it shall set the HEz Passive Range Measurement Support field of the Extended Capabilities element to 0.~~

If the STA in which dot11FineTimingMsmtRespActivated is true supports:

(a) Passive Location Ranging, it shall set the Passive Location Ranging Responder Measurement Support field of the Extended Capabilities element to 1. Otherwise it shall set the Passive Location Ranging Responder Measurement Support field of the Extended Capabilities element to 0.

If the STA in which dot11FineTimingMsmtInitActivated is true supports:

(a) Passive Location Ranging, it shall set the Passive Location Ranging Initiator Measurement Support field of the Extended Capabilities element to 1. Otherwise it shall set the Passive Location Ranging Initiator Measurement Support field of the Extended Capabilities element to 0.

A STA in which dot11FineTimingMsmtRespActivated is false shall set the Fine Timing Measurement Responder field of the Extended Capabilities element to 0.

A STA in which dot11FineTimingMsmtInitActivated is false shall set the Fine Timing Measurement Initiator field of the Extended Capabilities element to 0.

***TGaz Editor: Edit Section 11.22.6.4.1 titled ‘FTM Measurement exchange overview’ as follows:***

**11.22.6.4.1 FTM Measurement exchange overview**

FTM measurement has three basic scheduling mechanisms:

— RSTA centric EDCA based legacy scheduling mode (including DMGz and EDMGz) described in section 11.22.6.4.2

— HEz scheduling mode described in section 11.22.6.4.3

— VHTZ scheduling mode described in section 11.22.6.4.4

— ~~HEz~~ passive location ranging ~~range~~ mode described in section ~~11.22.6.4.8~~ 11.22.6.4.9

***TGaz Editor: Edit Section 11.22.6.4.9 titled ‘Measurement Exchange in HEz Passive Range mode’ as follows:***

11.22.6.4.9 Measurement Exchange in HEz Passive ~~Range~~ Location Ranging mode

11.22.6.4.9.1 General

The Passive Location Ranging mode is a variant of the HEz Ranging mode that consists of ranging exchanges between an RSTA and a set of ISTAs. These ranging exchanges and associated measurement reporting are set up such that an arbitrary STA can listen in to them and use the ranging exchanges and reported ranging measurements to estimate its differential distance to pairs or sets consisting of the RTA and one or more ISTAs. This listening STA need not itself be an active (as in transmitting) participant in the ranging exchange. That is, this listening STA can passively estimate differential distances to the RTA and the ISTAs. It can then use these differential distances together with knowledge of the RSTA and ISTA locations to estimates its own location.

An ISTA whose ~~dot11PassiveRangingImplemented~~ dot11PassiveLocationRangingInitiatorActivated ~~equal to~~ is true and an RSTA whose ~~dot11PassiveRangeImplemented~~ dot11PassiveLocationRangingResponderActivated ~~equal to~~ is true may activte ~~HEz passive range mode. In~~ passive location ranging exchanges in which case, the ISTA and RSTA follow the rules described in subclause ~~11.22.6.4.2~~ 11.22.6.4.3(Measurement Exchange in HEz Mode) with the ~~following~~ exceptions~~:~~ described in Section 11.22.6.4.9 (Measurement Exchange in HEz Passive Range Location Ranging mode), with subsections.

An RSTA in which dot11PassiveLocationRangingRespoinderActivated is true shall set the Passive Location Ranging Responder Measurement Support field in the Extended Capabilities element to 1.

When an ISTA sets the Passive Location Ranging field in the HEz Specific Parameters field in an initial Fine Timing Measurement Request frame to 1, the ISTA shall set the Secure LTF Required subfield in the Ranging Parameters field in an initial Fine Timing Measurement Request frame to 0.

When an RSTA has set the Passive Location Ranging Responder Measurement Support field to 1 in the Extended Capabilities element it transmits, an ISTA with dot11PassiveLocationRangingActivated equal to true may set the Passive Location Ranging field in the HEz Specific Parameters field in an initial Fine Timing Measurement Request frame to 1 to activate a Passive Location Ranging measurement session between the ISTA and the RSTA.

~~—~~ The RSTA sends the ~~HEz~~ Passive Location ~~Uplink~~ Sounding ~~(PUS)~~ Sub-variant Location Trigger frame instead of the HEz Uplink Sounding Sub-variant Location Trigger frame. Upon receipt of the ~~HEz PUS~~ Passive Location ~~Uplink~~ Sounding Sub-variant Location Trigger frame, the ISTA responds with an uplink HEz SU sounding NDP PPDU instead of an uplink HEz TB sounding NDP PPDU. See 11.22.6.4.~~8~~9.2 (~~HEz~~ Passive ~~Range~~ Location Ranging Measurement Sounding) for further details.

~~—~~ The RSTA broadcasts two RSTA Broadcast Passive Location Measurement Report frames containg ~~TOF measurement executed at the RSTA and ISTAs~~ measurement data and related information. See 11.22.6.4.~~8~~9.3 (HEz Passive ~~Range~~ Location Ranging Measurement Reporting) for further details.

~~An RSTA in which dot11PassiveRangeImplemented is true shall set the HEz Passive Range Measurement Support field in the Extended Capabilities element to 1.~~

~~When an RSTA has set the HEz Passive Range Measurement Support field to 1 in the Extended Capabilities element it transmits, an ISTA with dot11PassiveRangeImplemented equal to true may set the HEz Type subfield in the HEz Specific Parameters field in an initial Fine Timing Measurement Request frame to 1 to activate an HEz passive range measurement exchange mode between the ISTA and the RSTA.~~

~~When an ISTA sets the HEz Type subfield in the HEz Specific Parameters field in an initial Fine Timing Measurement Request frame to 1, the ISTA shall set the Secure LTF Required subfield in the Ranging Parameters field in an initial Fine Timing Measurement Request frame to 0.~~

The Passive Location Ranging exchanges occur in the scheduled Passive Location Ranging Availability windows. The RSTA manages assigning a Passive Location Dialog Token number to each Passive Location Polling-Sounding-Reporting triplet. The Passive Location Dialog Token cannot be set to zero though as that value is reseved for use by ISTAs to report that their Passive Location Ranging measurements reported stem from the current Passive Location Ranging Polling-Sounding-Reporting triplet. See Sections 9.6.7.38 (ISTA Passive Location Measurement Report frame format) and 9.6.7.nnn (Primus RSTA Broadcast Passive Location Measurement Report frame format).

11.22.6.4.9.2 HEz Passive ~~Range~~ Location Ranging Measurement Sounding

The ~~HEz passive range~~ Passive Location Ranging measurement sounding part commences a SIFS time after the HEz polling part and is the 2nd part of the ~~HEz passive range~~ Passive Location Ranging measurement sequence. The ~~HEz passive range~~ Passive Location Ranging measurement sounding part is composed by one or more ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame and ~~an~~ uplink HEz SU sounding NDP PPDU exchange sequences, a Ranging NDPA frame, and a downlink HEz SU sounding NDP PPDU transmission~~s~~.

An RSTA shall transmit one or more ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frames each of which is addressed to a single ISTA, the first one coming a SIFS time after the HEz polling part.

An ISTA addressed by the RA field of the ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame shall transmit an uplink HEz SU sounding NDP PPDU a SIFS time after the reception of the ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame.

After sending all pending ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frames, the RSTA shall transmit a Ranging NDPA frame followed by a downlink HEz SU sounding NDP PPDU with a SIFS interval.

An RSTA transmitting a~~n~~ ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame to an ISTA shall not use a bandwidth wider than that indicated in the initial Fine Timing Measurement frame sent to the ISTA and the RSTA shall set the TXVECTOR parameter CH\_BANDWIDTH to be the same value as the BW subfield of the Common Info field in the ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame.

An RSTA transmitting a Ranging NDP Announcement frame and a downlink HEz SU sounding NDP PPDU after receiving an uplink HEz TB sounding NDP PPDU as a response of a~~n~~ ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame shall set the TXVECTOR parameter CH\_BANDWIDTH to be the same value as the BW subfield of the Common Info field in the ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame.

An ISTA transmitting an uplink HEz SU sounding NDP PPDU as a response of a~~n~~ ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame shall set the TXVECTOR parameter CH\_BANDWIDTH to be the same value as the BW subfield of the Common Info field in the ~~HEz PUS~~ Passive Location Sounding Sub-variant Location Trigger frame.

Similar to in HEz Ranging, an ISTA participating in a Passive Location Ranging exchange should measure the TOD of its own HEz SU sounding NDP PPDU and the TOA of when it received the RTA’s HEz SU sounding NDP PPDU. In addition, optionally the ISTA also reports the TOAs of when it receives the HEz SU sounding NDP PPDUs transmited by the other ISTAs participating in the Passive Location Raning exchange. By reporting the TOA time stamps for then it received the other ISTAs NPD transmissions, the quality of the location estimate for a STA listening in to the Passive Location exchanges can be improved.

The max number of Nsts used in the Passive Location Ranging exchanges is limited to 4.

11.22.6.4.9.3 ~~HEz~~ Passive ~~Range~~ Location Ranging Measurement Reporting

The last part of the ~~HEz~~ ~~p~~Passive ~~range~~ Location Ranging measurement sequence is the ~~HEz~~ ~~p~~Passive ~~range~~ Location Ranging measurement reporting part and ~~appears~~ is transmitted a SIFS time after the ~~HEz~~ ~~p~~Passive ~~range~~ location ranging measurement sounding part.

In the ~~HEz~~ ~~passive range~~ Passive Location Ranging measurement reporting part, an RSTA shall send a Location Measurement Report frame and the LMR Sub-variant Location Trigger frames to one or more ISTAs that sent an uplink HEz SU sounding NDP PPDU in the preceding ~~HEz~~ passive ~~range~~ location ranging measurement sounding part according to 11.22.6.4.~~2~~3.4 (HEz Measurement Reporting Part). An ISTA addressed by the LMR Sub-variant Location Trigger frame shall transmit ~~a~~ an ISTA Passive Location Measurement Report frame a SIFS time after the LMR Sub-variant Location Trigger frame transmission. The ISTA Passive Location Measurement Report frame is defined in Section 9.6.7.38 (ISTA Passive Location Measurement Report frame format) and contains the ISTAs TOD and TOA time stamps measured by the ISTA during a Passive Location Polling-Sounding-Reporting triplet identified by a Passive Location Dialog Token included in the report.

The RSTA shall send two ~~broadcast~~ RSTA Broadcast Passive Location Measurement Report frames a SIFS time after receiving the ISTA Passive Location Measurement Report frames from ~~containing TOF measurements executed at~~ the ISTA~~s~~.

The Primus RSTA Broadcast Passive Location Measurement Report frame containing one or more of the following is transmitted first.

~~— TBD~~

* Current Passive Location LCI Table Number
* Passive Location LCI Table Countdown
* RSTA Passive Location LMR
* Passive Location LCI Table

See Section 9.6.7.nnn Primus RSTA Broadcast Passive Location Measurement Report frame format.

The Secundus RSTA Broadcast Passive Location Measurement Report frame containing one or more of the following is ~~transmitted~~ subsequently transmitted ~~with~~ a SIFS interval later.

~~— TBD~~

* ISTA Passive Location Measurement Reports

See Section 9.6.7.mmm Secundus RSTA Broadcast Passive Location Measurement Report frame format.

***TGaz Editor: Edit the following in Annex C.3 as indicated:***

**C.3 MIB Detail**

*Insert the following entry at the end the following object as shown below:*

Dot11WirelessMgmtOptionsEntry ::=

SEQUENCE {

…

dot11RMCivicConfigured TruthValue,

dot11SecureLTFImplemented TruthValue

dot11PassiveLocationRangingResponderActivated TruthValue

dot11PassiveLocationRangingInitiatorActivated TruthValue

}

…

dot11PassiveLocationRangingResponderActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that a support for Passive Location Ranging acting as a responder is implemented (see Section 11.22.6.4.9 Measurement Exchange in Passive Location Ranging mode) is implemented. The capability is disabled otherwise."

DEFVAL { false }

::= { dot11WirelessMgmtOptionsEntry <appropriate number>}

dot11PassiveLocationRangingInitiatorActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that a support for Passive Location Ranging acting as an initiator is implemented (see Section 11.22.6.4.9 Measurement Exchange in Passive Location Ranging mode) is implemented. The capability is disabled otherwise."

DEFVAL { false }

::= { dot11WirelessMgmtOptionsEntry <appropriate number>}