IEEE P802.11
Wireless LANs

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| Phase Roll Based TOA in Passive Location Ranging – Amendment Text |
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**Abstract**

This submission proposes resolutions amendment text for phase roll based TOA in Passive Location Ranging.

The proposed changes are relative to TGaz Draft 0.6 and TGmd Draft 1.0.

***TGaz Editor: Edit Section ‘9.4.2.nnn (ISTA Passive Location Measurement Report’ as indicated 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 | 1 | 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.

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  | B83 B87 |
|  | Type | Valid | Time-Stamp | Time-Stamp Error | RID | Phase Shift Feedback | Reserved |
| bits: | 1 | 1 | 48 | 16 | 16 | 1 | 4 |

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 Valid subfield is set to 1 if the time-stamp is deemed valid and set to zero otherwise.

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 Phase Shift Feedback field is set to one if the time-stamp reported is of the phase shift feedback type, see Section 11.22.6.4.6a (Time of Arrival estimation using Phase Shift Feedback), otherwise this field is set to 0.

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. When the STA that transmitted the NDP is the RSTA the value zero is reported in the RID subfield.

The Feedback Type field contains an indication of the feedback type of the Time-Stamp field. The Feedback type field is set to 0 if the Time-Stamp field contains the ToA value of the corresponding DL NDP, and the Feedback Type field is set to 1 if the Time-Stamp field contains the Phase Shift value of the corresponding DL NDP. For TOD time stamps the bit is reserved.

***TGaz Editor: Edit Section 11.22.6.4.10.2 titled ‘TB Passive Range Measurement Sounding’ as follows:***

11.22.6.4.10.2 Passive Location Ranging Measurement Sounding

The Passive Location Ranging measurement sounding part commences a SIFS time after the TB polling part ~~in the~~ and is the 2nd part of the Passive Location Ranging measurement sequence. The Passive Location Ranging measurement sounding part is composed by one or more Passive Location Sounding Sub-variant Location Trigger frame and HE Ranging NDP PPDU exchanges, a Ranging NDPA frame, and an HE Ranging NDP PPDU transmission.

An RSTA shall transmit one or more 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 TB polling part.

An ISTA addressed by the RID in ~~of~~ the Passive Location Sounding Sub-variant Location Trigger frame shall transmit an HE Ranging NDP PPDU a SIFS time after the reception of the Passive Location Sounding Sub-variant Location Trigger frame.

After sending all pending Passive Location Sounding Sub-variant Location Trigger frames, the RSTA shall transmit a Ranging NDPA frame followed by an HE Ranging NDP PPDU with a SIFS interval.

An RSTA transmitting aPassive 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 Passive Location Sounding Sub-variant Location Trigger frame.

An RSTA transmitting a Ranging NDP Announcement frame and an HE Ranging NDP PPDU after receiving an HE Ranging NDP PPDU as a response to a 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 Passive Location Sounding Sub-variant Location Trigger frame.

An ISTA transmitting an HE Ranging NDP PPDU as a response to a 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 Passive Location Sounding Sub-variant Location Trigger frame.

Similar to in TB Ranging, an ISTA participating in a Passive Location Ranging exchange shall measure the TOD of its own HE Ranging NDP PPDU and the TOA of when it receives the RSTA’s HE Ranging NDP PPDU. In addition, optionally the ISTA also reports the TOAs of when it receives the HE Ranging NDP PPDUs transmitted by the other ISTAs participating in the Passive Location Ranging exchange. By reporting the TOA time stamps for when 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.

When Phase Shift TOA merasurements are negotiated for the ISTA, the ISTA shall measure Phase Shift TOAs as defined in Section 11.22.6.4.6a (Time of Arrival estimation using Phase Shift Feedback).

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

***TGaz Editor: Edit Section 11.22.6.4.10.3 titled ‘TB Passive Range Measurement Reporting’ as follows:***

11.22.6.4.10.3 Passive Location Ranging Measurement Reporting

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

In the 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 HE Ranging NDP PPDU in the preceding passive location ranging measurement sounding part. An ISTA addressed by the LMR Sub-variant Location Trigger frame shall transmit 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 RSTA Broadcast Passive Location Measurement Report frames a SIFS time after receiving the ISTA Passive Location Measurement Report frames from the ISTA.

The Primus RSTA Broadcast Passive Location Measurement Report frame containing the following is transmitted first:

* Passive Location Dialog Token
* Current Passive Location LCI Table Number
* Passive Location LCI Table Countdown
* RSTA Passive Location LMR
* Passive Location LCI Table (optionally present)

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 the following is subsequently transmitted a SIFS interval later.

* ISTA Passive Location Measurement Reports

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

The TOA time-stamps reported in the ‘ISTA Passive Location Measurement Report elements’ contained in the Secundus RSTA Broadcast Passive Location Measurement Report frame shall be time-of-arrival type time-stamps and not phase shift based time-stamps. That is, if the ISTA is reporting phase-shift based time-stamps to the RSTA, then the RSTA shall convert them to time-of-arrival type time stamps before broadcasting them in the ‘Secundus RSTA Broadcast Passive Location Measurement Report frame’.