IEEE P802.11
Wireless LANs

|  |
| --- |
| Informative text for passive location ranging |
| Date: 2019-11-12 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Erik Lindskog | Samsung | 3655 N 1st St, San Jose, CA 95134 |  | e.lindskog@samsung.com |

Abstract

This document proposes resolutions to TGaz LB240 comments related to Passive TB Ranging, in particular related to general description of its function or description. The changed described here are in relation to [1].

TGaz LB240 CIDs addressed: 1291, 1578, 1575, 1576, 2287, 1577, 2218, 2212, 2213, and 2340.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 1291 | 126.37 | 11.22.6.4.10.3 | "transmitted with a SIFS": remove strikethough text | as in comment | Revised. TGaz editor, make the changes as shown below in document 11/19-35. |
| 1578 | 126.13 | 11.22.6.4.10.3 | A detailed description of and figure depicting Passive Location Ranging measurement reporting is missing. | Add detailed description of and figure depicting Passive Location Ranging measurement reporting. | Revised. A depiction of the Passive TB Ranging measurement reporting phase is added. TGaz editor, make the changes as shown below in document 11/19-35. |
| 1575 | 125.16 | 11.22.6.4.10.2  | Timing diagram of a Measurement Sounding part in Passive Location Ranging is missing. | Add Timing diagram of a Measurement Sounding part in Passive Location Ranging that also shows the meausrments a passive STA (PSTA) is doing. | Revised. Added Timing diagram of a Measurement Sounding part in Passive Location Ranging that also shows the meausrments a passive STA (PSTA) is doing. TGaz editor, make the changes as shown below in document 11/19-35. |
| 1576 | 125.16 | 11.22.6.4.10.2 | An example of what calculations a passive STA (PSTA) is doing when listeing in to Passive Location Ranging exchanges is missing. | As in comment. | Revised. Added Timing diagram of a Measurement Sounding part in Passive Location Ranging that also shows the meausrments a passive STA (PSTA) is doing. TGaz editor, make the changes as shown below in document 11/19-35. |
| 2287 | 124.26 |  | "An ISTA whose dot11PassiveLocationRangingInitiatorActivated is true and an RSTA whose dot11PassiveLocationRangingResponderActivated is true may activate passive location ranging exchanges in which case, the ISTA and RSTA follow the rules described in subclause 11.22.6.4.3 (Measurement Exchange in TB Mode) with the exceptions described in Section 11.22.6.4.9 (Measurement Exchange in TB Passive Range Location Ranging mode), with subsections." The RSTA and ISTA that perform passive ranging have distinct functionality from the RSTA and ISTA of active ranging. They should be given a separate name, e.g., anchor STAs. | As in comment. | Rejected. For ease of specifying the Passive TB Ranging protocol as a variant of TB Ranging we are retaining the RSTA and ISTA naming. A passive STA that listens in on the Passive TB Ranging is however denoted as a PSTA. |
| 1577 | 125.15 | 11.22.6.4.10 | A description of how a passive STA (PSTA) can listen in to multiple Passive Location Ranging sessions performed my multiple RSTAs and multiple ISTAs is missing. | Add a description of how a passive STA (PSTA) can listen in to multiple Passive Location Ranging sessions performed my multiple RSTAs and multiple ISTAs. | Revised. Added description. TGaz editor, make the changes as shown below in document 11/19-35. |
| 2218 | 71.02 | 11.22.6.4.9.3 | [Re-raising this comment from the comment collection, as it is not possible to determine from 18/1544r8 whether/how it was addressed. References are to the CC draft and hence may be wrong against D1.0.]"The RSTA shall send two broadcast Passive Location Measurement Report frames a SIFS timeafter receiving the Location Measurement Report frame " -- does this mean an MU transmission has to be used? | Clarify. I think this is trying to say that following the LMR frame rx the RSTA sends one LMR frame after SIFS, then another LMR frame SIFS after the first | Revised. TGaz editor, make the changes as shown below in document 11/19-35. |
| 2212 | 70.01 | 11.22.6.4.9.2 | [Re-raising this comment from the comment collection, as it is not possible to determine from 18/1544r8 whether/how it was addressed. References are to the CC draft and hence may be wrong against D1.0.]"The HEz passive range measurement sounding part commences a SIFS time after the HEz polling 2part and is the 2nd part of the HEz passive range measurement sequence. " but what's the first part? | Make sure that for all the techniques all three parts are covered (by having a subclause for each, even if to say e.g. that the passive HEz polling part is the same as the active HEz polling part). And include a figure showing all the parts/phases/whatever you end up deciding to call them | Revised. Added subclauses for each part and added a figure showing the parts. TGaz editor, make the changes as shown below in document 11/19-35. |
| 2213 | 69.00 | 11.22.6.4.9 | [Re-raising this comment from the comment collection, as it is not possible to determine from 18/1544r8 whether/how it was addressed. References are to the CC draft and hence may be wrong against D1.0.]There needs to be some information on how passive ranging works, i.e. how you can passively determine ranges from the information in certain frames you overhear | As it says in the comment | Revised. Added description. TGaz editor, make the changes as shown below in document 11/19-35. |
| 2340 | 61.04 | 9.4.2.286 | Please unify subclause titles of 9.4.2.286 and 9.4.2.287 "ISTA Passive Location Measurement Report element" vs. "RSTA Passive Location LMR element" | as in comment | Revised. TGaz editor, make the changes as shown below in document 11/19-35. |

***TGaz Editor: Change the text in Subclause 11.22.6.1.3 (Passive Location Ranging) as follows:***

**11.22.6.1.3 Passive Location Ranging overview**

**(#1520, #1542, #1543, #1544, #1548, #1551, #1552, #1553, #1554, #1555, #1556, #1561,** 19 **#1562, #1564, #1565, and #1574)**

Passive Location Ranging is a variant of the TB ranging mode referred to in Subclause 11.22.6 (Fine timing measurement (FTM) procedure). In all aspects, except where explicitly stated differently, the Passive Location Ranging mode, its protocols, procedures, components, and definitions follow the rules for TB ranging.

In particular, along the general statement in the paragraph above, the text in the following subclauses, and their subclauses, apply also to Passive Location Ranging:

* Subclause 11.22.6.1. EDCA based Ranging and TB Ranging overview
* Subclause 11.22.6.3.3 (“Negotiation for TB and non-TB Ranging measurement exchange”)
* Subclause 11.22.6.4.3 (“TB ranging measurement exchange”)
* Subclause 11.22.6.5 (Fine Timing Measurement parameter modification)
* Subclause 11.22.6.5.1 (Availability Window parameter modification)
* Subclause 11.22.6.6.2 (TB Ranging and non-TB Ranging session termination)

Below are a list of example exceptions for Passive Location Ranging where it does not follow the rules for TB Ranging:

* The rules and procedures specific for the secure version of TB Ranging does not apply to Passive Location Ranging.
* The RSTA uses the ‘Passive Location Ranging’ Ranging Trigger Subtype for its sounding trigger frames.
* The ISTAs use HE Ranging NDP PPDUs for its I2R NDPs
* The ISTAs does not use the Location Measurement Report frame for reporting of ISTA2RSTA LMR but instead uses the ISTA Passive Location Measurement Report frame for this purpose, with its associated different measurements.
* The RSTA send the Primus and Secundus RSTA Broadcast Passive Location Measurement Report frames at the end of the measurement reporting phase.
* The number of spatial streams (NSTS) for passive location ranging is limited to max 4.
* When phase shift feedback is negotiated for Passive TB Ranging, both the RSTA and the ISTA measures and reports PS-TOAs, in addition to measuring and reporting TOAs.

The Passive Location Ranging mode 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 formed by RSTAs and/or ISTAs. The listening STA, a ‘passive’ STA or PSTA, is not itself an active transmitting participant in the ranging exchanges. That is, the PSTA can passively estimate its differential distances to the pairs of RSTAs and/or ISTAs. See Subclause 11.22.6.4.8.3 (Passive TB ranging measurement sounding phase) for a detailed description of how this differential distance can be calculated. It can then use these differential distances together with knowledge of the RSTA and ISTA locations to estimates its own location.

The RSTA centric Scheduling for Passive Location Ranging operation operates as the RSTA centric Scheduling for TB Ranging operation referred to in subclause 11.22.6.1.1 (EDCA based Ranging and TB Ranging overview). The availability window is here referred to as a Passive Location Ranging Availability window. The Passive Location Ranging is scheduled by the RSTA in an availability window used for passive location.

In order to announce the scheduling and parameters of the availability window for passive location ranging, the RSTA includes an RSTA Availability Element (see subclause 9.4.2.278 (RSTA Availability Window element)) in its beacon frame (see subclause 9.3.3.3 (Beacon frame format)). Here the RSTA Availability Window element contains a single Availability Window Information field with the Passive Location Ranging Availability Window bit is set to 1 and with the Passive TB Ranging parameters subfield included. (#1646)

The purpose of the announcement of the availability window for the passive location ranging is to enable PSTAs to listen to the Passive Location Ranging exchanges that are occurring there.

(#1577)

Consider Passive TB Ranging between a set of RSTAs and a set of ISTAs as depicted in Figure 11-35b. Here three access points, AP1, AP2, and AP3 act as three Passive TB Ranging responder stations, RSTA1, RSTA2, and RSTA3. RSTA1 operates ranging exchanges in an availability window for Passive TB Ranging and is performing Passive TB Ranging exchanges with ISTA1, ISTA2, ISTA3, ISTA4, ISTA5, and ISTA6.

The PSTA is depicted, with the dashed arrows, as listening in to the Passive TB Ranging exchange between RSTA1 and ISTA4. Generalizing, the PSTA has the opportunity to receive the transmissions of all Passive TB Ranging exchanges occurring. The reception of each of these ranging exchange transmissions enables the PSTA to estimate its differential distance with respect to the RSTA-ISTA pair and use this information towards its location estimation.

In addition to the ranging exhanges between the ISTAs and RSTA1, the Passive TB Ranging protocol also allows the ISTAs to perform ranging exchanges between each other. An example of one such ranging exchange is depicted in Figure 11-35b in form of the dotted double arrow between ISTA1 and ISTA2.

Furthermore, if one of the other APs in Figure 11-35b temporarily takes on the role of being an ISTA, it can also participate in RSTA1’s Passive TB Ranging opportunity and perform Passive TB Ranging exchanges with RSTA1.

****

**Figure 11-35b—** **Example of Passive TB Ranging used for PSTA location – RSTA1 (AP1) operating a Passive TB Ranging opportunity. (#1577)**

At a later point in time, RSTA2 may operate ranging exchanges in an availability window of its own for Passive TB Ranging. The ISTAs may then switch to performing Passive TB Ranging with RSTA2. At a yet later point in time, RSTA3 may operate ranging exchanges in an availability window for Passive TB Ranging for RSTA3. Again, the ISTAs may now perform Passive TB Ranging with RSTA3.

Each of the access points operating as RSTA1, RSTA2, and RSTA3, announces the timing and bandwidth of its Ranging Availbility window in its beacon in a RSTA Availability Window element for Passive TB Ranging. The PSTA can by listening to the AP’s beacons, be informed about when and with what bandwidth the different Passive TB Ranging availbillity windows will occur.

The PSTA can thus listen to all of these ranging exchanges. Considering all ranging exchanges between all RSTAs and all ISTAs, the PSTA has the opportunity to overhear a large set of ranging exchanges between RSTAs and ISTAs in different locations, enabling the use of all of them towards its location estimation and also mitigate issues with blocked LOS conditions.

The locations of the RSTA/ISTAs or ISTA/ISTAs together with their differential distance with respect to the PSTA, generates a set of hyperbolic curves to which the PSTAs location is constrained. The intersection of these hyperbolic curves, or the best approximation to their intersection, is then an estimate of the PSTA’s location.

***TGaz Editor: Change the text in Subclause 11.22.6.3.8 (Passive Location Ranging Measurement Negotiation) as follows:***

**11.22.6.3.8 Passive Location Ranging Measurement Negotiation**

The Passive Location Ranging measurement negotiation follows the rules and procedures for the TB Ranging measurement negotiation, detailed in Section 11.22.6.3.3 (Trigger-based and non-Trigger-based Ranging Measurement Negotiation), unless explicitly stated otherwise**. (#1520, #1542, #1543, #1544, #1548, #1551, #1552, #1553, #1554, #1555, #1556, #1561, #1562, #1564,** 34 **#1565, and #1574)**

An RSTA in which dot11PassiveLocationRangingResponderImplemented is true shall set the Passive Location Ranging Responder Measurement Support field in the Extended Capabilities element to 1.

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 dot11PassiveLocationRangingInitiatorActivated equal to true may set the Passive Location Ranging field in the TB Specific Parameters field in an initial Fine Timing Measurement Request frame to 1 to request a Passive Location Ranging measurement session between the ISTA and the RSTA. **(#1287)**

In Passive TB Ranging, ISTA2RSTA LMR feedback is mandatory. Therefore:

* when an ISTA sets the Passive Location Ranging field in the TB Specific Parameters field in an initial Fine Timing Measurement Request frame to 1 it shall also set the ISTA2RSTA LMR Feedback subfield in the Ranging Parameters field of the Ranging Parameters element in the initial Fine Timing Measurement Request frame to 1, and
* the RSTA shall set the ISTA2RSTA LMR Feedback subfield in the Ranging Parameters field of the Ranging Parameters element in the initial Fine Timing Measurement Request frame to 1 to request ISTA2RSTA LMR feedback.

To grant an ISTA Passive Location Ranging, the RSTA shall respond with the Passive Location Ranging subfield in the Ranging Parameters field to set 1 in the corresponding IFTMR.

When an ISTA sets the Passive Location Ranging field in the TB 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.

***TGaz Editor: Change the text in Subclause 11.22.6.4.8 (Measurement exchange in passive TB ranging mode) as follows:***

**11.22.6.4.8 Measurement exchange in passive TB (#1807, #1808) ranging mode**

**11.22.6.4.8.1 General**

As stated in subclause 11.22.6.1.3 (“Passive Location Ranging”), the Passive Location Ranging mode is a variant of the TB ranging mode. In all aspects, except where explicitly stated differently, the Passive Location Ranging mode, its protocols, procedures, components, and definitions follow the rules for TB ranging mode. **(#1520, #1542, #1543, #1544, #1548, #1551, #1552, #1553, #1554, #1555, #1556, #1561, #1562, #1564, #1565, and #1574)**

In particular the measurement exchanges for Passive Location Ranging follows the rules and procedures described in subclause 11.22.6.4.3 (TB ranging measurement exchange), with subclauses, unless explicitly stated otherwise.

Some of the exceptions for the Passive Location Ranging measurement session are:

- The RSTA sends the Passive Location Subvariant Ranging Trigger frame instead of the TB Sounding Subvariant Ranging Trigger frame. Upon receiving of the Passive Location Subvariant Ranging Trigger frame, the ISTA responds with an HE Ranging NDP instead of an HE TB Ranging NDP. See 11.22.6.4.8.3 (Passive TB ranging measurement sounding phase) for further details.

- The RSTA broadcasts two frames, the Primus and Secundus RSTA Broadcast Passive Location Measurement Report frames, containing measurement data and related information. See 11.22.6.4.8.4 (Passive TB ranging measurement reporting phase) for further details.

The Passive Location Ranging exchanges occur in an availability window used for passive location.

**11.22.6.4.8.2 Polling Phase of Passive Location Ranging**

The polling phase of Passive Location Ranging follows the same rules and procedures for the polling phase of TB ranging described in subclause 11.22.6.4.3.2 (“Polling Phase of TB Ranging”). **(#1520, #1542, #1543, #1544, #1548, #1551, #1552, #1553, #1554, #1555, #1556,**  **#1561, #1562, #1564, #1565, and #1574)**

**11.22.6.4.8.3 Passive TB ranging measurement sounding phase**

The Passive Location Ranging measurement sounding follows the same rules and procedures for the measurement sounding for TB Ranging described in subclause 11.22.6.4.3.3 (“TB Ranging Measurement Sounding Phase”), unless explicitly stated otherwise. **(#1520, #1542, #1543, #1544,**  **#1548, #1551, #1552, #1553, #1554, #1555, #1556, #1561, #1562, #1564, #1565, and #1574)**

The second phase of the Passive Location Ranging measurement sequence, after the Passive Location Ranging polling phase, is called the Passive Location Ranging measurement sounding phase. The Passive Location Ranging measurement sounding phase is composed by one or more Passive Location Sounding subvariant Ranging Trigger frame and HE Ranging NDP exchanges, a Ranging NDPA frame, and an HE Ranging NDP transmission. See Figure 11-36s (Passive TB Ranging Polling, measurent sounding, and measurement reporting phases).



**Figure 11-36s—Passive TB Ranging Polling, measurent sounding, and measurement reporting phases. (#2212)**

In Passive Location Ranging, the Trigger frame that the RSTA send is of variant Ranging and subvariant Passive Location Sounding. The Trigger frame here only allocates uplink resources to a single STA.

An RSTA shall transmit one or more Passive Location Subvariant Ranging Trigger frames, each of which is addressed to a single ISTA, the first one coming a SIFS time after the TB polling phase.

An ISTA addressed by the RSID in the Passive Location Subvariant Ranging Trigger frame shall transmit an HE Ranging NDP a SIFS time after the reception of the Passive Location Subvariant Ranging Trigger frame.

An RSTA transmitting a Passive Location Sounding subvariant Ranging Trigger frame 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 Subvariant Ranging Trigger frame.

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

An ISTA transmitting an HE Ranging NDP as a response of to a Passive Location Sounding subvariant Ranging 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 subvariant Ranging 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 and the ToA, and alternatively in addition the PS-TOA, of when it receives the RSTA’s HE Ranging NDP. In addition, optionally the ISTA also measures and reports the TOAs, and alternatively in addition the PS-TOAs, of when it receives the HE Ranging NDPs transmitted by the other ISTAs participating in the Passive Location Ranging exchange. By reporting the timestamps for when it received the other ISTAs NDP transmissions, the quality of the location estimate for a PSTA 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.

See Figure 11-36t for an example of time stamps measured by the RSTA, ISTA and a PSTA in a Passive TB Ranging measurement exchange. The timestamp values t1, t2, t3 and t4 are analogous to the correspondly labeled time stamps in Subclause 11.22.6.4.3.3 (Measurement Sounding Phase of TB) for TB Ranging. The time-stamps t5 and t6 are the times at which the I2R NDP and R2I NDPs arrive at the PSTA, respectively.



**Figure 11-36t—Example Timing diagram of a Measurement Sounding Phase in Passive TB Ranging (#1575, #1576)**

The PSTA may use the ISTA’s and RSTA’s time stamps, together with its own measured TOAs of the ranging NDPs, t5 and t6, to calculate its differential time of flight to the RSTA and the ISTA.

The differential time of flight from PSTA to RSTA and ISTA (DToF\_PRI) is defined by equation (11-ptbr1)

DToF\_PRI = ToF\_PR – ToF\_PI, (11-ptbr1)

where ToF\_PR is the time of flight between the PSTA and the RSTA, and ToF\_PI is the time of flight between the PSTA and the ISTA. The differential time of flight DToF\_PRI can be computed as as per equation (11-ptbr2):

DToF\_PRI = t6 – t5 – 0.5\*t3’ + 0.5\*t2’ – 0.5\*t4’ + 0.5\*t1’, (11-ptbr2):

Where:

* t1’ and t4’ are the time at which the I2R NDP was transmitted from the ISTA and the time at which the R2I NDP was received by the ISTA, respectively, converted by the PSTA from the ISTA’s time basis to the PSTA’s time basis.
* t2’ and t3’ are the time at which the I2R NDP was received by the RSTA and the time at which the R2I NDP was transmitted by the RSTA, respectively, converted by the PSTA from the RSTA’s time basis to the PSTA’s time basis.

At the PSTA, the mechanism by which t1’ and t4’ is derived from t1, t4, the ISTA’s reported CFO, and the PSTA’s CFO measured with respect to the RSTA, is implementation dependent.

At the PSTA, the mechanism by which t2’ and t3’ is derived from t2, t3, and the PSTA’s CFO measured with respect to the RSTA, is implementation dependent.

By multiplying the differential time of flight, DToF\_PRI, with the speed of light, the differential distance from PSTA to RSTA and ISTA can be computed. **(#1575, #1576, #2213)**

See subclause 11.22.6.4.8.5 (Passive TB Ranging differential time-of-flight calculations using phase shift TOA time stamps) for how the PSTA’s differential distance to the RSTA and the ISTA can be computed using PS-TOAs measured by the RSTA and the ISTA.

**11.22.6.4.8.4 Passive TB ranging measurement reporting phase**

The Passive Location Ranging measurement reporting follows the same rules and procedures for the measurement reporting for TB Ranging described in subclause 11.22.6.4.3.4 (“TB Ranging Measurement Sounding Phase”), unless explicitly stated otherwise.



**Figure 11-36u—Passive TB Ranging measurement reporting phase (#1578)**

The last phase of the Passive Location Ranging measurement sequence is the Passive Location Ranging measurement reporting phase and is transmitted a SIFS time after the Passive location ranging measurement sounding phase. See Figure 11-36u (Passive TB Ranging measurement reporting phase) for a depiction of the Passive TB Ranging measurement reporting phase.

In the Passive Location Ranging measurement reporting phase, an RSTA shall send a Location Measurement Report frame and the LMR Subvariant Ranging Trigger to one or more ISTAs that sent an HE Ranging NDP in the preceding passive location ranging measurement sounding phase. An ISTA addressed by the LMR Subvariant Ranging Trigger frame shall transmit an ISTA Passive Location Measurement Report frame a SIFS time after the LMR Subvariant Ranging Trigger frame transmission to report its ISTA2RSTA LMR.

The ISTA Passive Location Measurement Report frame is defined in subclause 9.6.7.49 (ISTA Passive Location Measurement Report frame format) The ISTA Passive Location Measurement Report frame contains an ISTA Passive Location Measurement Report element, see Subclause 9.4.2.285 (ISTA Passive Location Measurement Report element), containing the TOD time stamp for the I2R NDP that the ISTA transmitted, the TOA, and alternatively in addition the PS-TOA, time stamp of the R2I NDP that the ISTA received from the RSTA, the CFO of the ISTA with respect to the RSTA, and optionally the TOAs, and alternatively in addition PS-TOAs, for I2R NDPs received from other ISTAs participating in the Passive Location Ranging Polling-Sounding-Reporting triplet identified by a Dialog Token included in the report.

The ISTA Passive Location Measurement Report frame shall include an entry for the ISTA's I2R NDP TOD. **(#1169)**

The ISTA shall set the More subfield in the More & N Timestamp Measurements Report field in the ISTA Passive TB Ranging Measurement Report element contained in the ISTA Passive TB Ranging Measurement Report frame to 1 if it has more timestamps ready to report but does not have space in its allocated resources by the RSTA for ISTA Passive TB Ranging Measurement Report frame. Else the ISTA shall set the More subfield to 0.

The RSTA shall send the Primus and Secundus RSTA Broadcast Passive Location Measurement Report frames, the Primus a SIFS time after receiving the ISTA Passive Location Measurement Report frames from the ISTAs and the Secundus a SIFS following the Primus. See Figure 11-36u (Passive TB Ranging measurement reporting phase). **(#2218)**

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

— Current Passive Location LCI Table Number

— Passive Location LCI Table Countdown

— RSTA Passive Location LMR

— Passive Location LCI Table (optionally present)

When the Passive Location LCI Table is present in the Primus Broadcast Passive Location Measurement Report frame, the RSTA LCI Report field of the Passive Location LCI Table Report element shall contain the Antenna Placement and Calibration subelement if the RSTA has dot11PassiveRangingAoDEnablementActivated set to 1, and shall not contain the Antenna Placement and Calibration subelement if the RSTA has dot11PassiveRangingAoDEnablementActivated set to 0. (#**2302**)

When the Passive Location LCI Table is present in the Primus Broadcast Passive Location Measurement Report frame, the corresponding entree of the ISTA LCI Reports Entries field of the Passive Location LCI Table Report element shall contain the Antenna Placement and Calibration subelement if the ISTA has dot11PassiveRangingAoDEnablementActivated set to 1, and shall not contain the Antenna Placement and Calibration subelement if the ISTA has dot11PassiveRangingAoDEnablementActivated set to 0. (#**2302**)

See subclause 9.6.7.39 Primus RSTA Broadcast Passive Location Measurement Report frame format.

The Secundus RSTA Broadcast Passive Location Measurement Report frame, containing the following, is subsequently transmitted after a SIFS time: **(#1291)**

— ISTA Passive Location Measurement Reports

See subclause 9.6.7.40 Secundus RSTA Broadcast Passive Location Measurement Report frame format.

***TGaz Editor: Insert a subclause heading on page 67 before line 22 as:***

**9.4.2.278 RSTA Availability Window element**

***TGaz Editor: Replace according to instructions listed here:***

Throughout the 802.11az draft, replace:

* ‘Passive Location Ranging’ with ‘Passive TB Ranging’
* ‘passive location ranging’ with ‘Passive Location Ranging’
* ‘passive location ranging’ with ‘Passive TB Ranging’
* ‘passive Location Ranging’ with ‘Passive TB Ranging’
* ‘passive TB ranging’ with ‘Passive TB Ranging’
* ‘Passive TB ranging’ with ‘Passive TB Ranging’
* ‘passive TB ranging’ with ‘Passive TB Ranging’
* ‘Passive Location Measurement’ with ‘Passive TB Ranging Measurement’
* ‘Passive Ranging’ with ‘Passive TB Ranging’
* ‘passive ranging’ with ‘Passive TB Ranging’
* ‘Passive Location LCI’ with ‘Passive TB Ranging LCI’
* ‘Passive Location Sounding’ with ‘Passive TB Sounding’
* ‘Passive Location subvariant’ with ‘Passive TB Ranging subvariant’
* ‘dot11PassiveLocationRangingResponderActivated’ with ‘dot11PassiveLocationRangingResponderImplemented’
* ‘dot11PassiveLocationRangingInitiatorActivated’ with ‘dot11PassiveLocationRangingInitiatorImplemented’
* ‘dot11PassiveTBRangingResponderActivated’ with ‘dot11PassiveTBRangingResponderImplemented’
* ‘dot11PassiveTBRangingInitiatorActivated’ with ‘dot11PassiveTBRangingInitiatorImplemented’
* ‘dot11PassiveLocationRanging’ with ‘dot11PassiveTBRanging’
* ‘dot11PassiveRanging’ with ‘dot11PassiveTBRanging’
* ‘RSTA Passive Location LMR’ with ‘RSTA Passive TB Ranging Measurement Report’ ***(TGaz Editor: Insert indication ‘(#2340)’ to the change here in the draft text.)***
* ‘Passive Location Subvariant’ with ‘Passive TB Ranging subvariant’
* ‘Passive Location exchanges’ with ‘Passive TB Ranging exchanges’
* ‘FTM passive location’ with ‘FTM Passive TB Ranging’
* ‘Measurement Sounding Part’ with ‘Measurement Sounding Phase’
* ‘measurement sounding part’ with ‘measurement sounding phase’
* ‘polling part’ with ‘polling phase’

***TGaz Editor: Change the text in Subclause 9.4.2.285 (ISTA Passive Location Measurement Report element) on P82L20 and P83L9 as follows:***

**9.4.2.285 ISTA Passive TB Ranging Measurement Report element *(#2340)***

**…**

The Dialog Token field shall be copied from the Sounding Dialog Token field in the Ranging

NDP Announcement frame of the corresponding to the measurement sounding phase in which

the reported ISTA’s timestamps were measured (see 11.22.6.4.3 (TB ranging measurement exchange) and 11.22.6.4.8 (Measurement exchange in passive ranging mode)).

…

The Timestamp subfield contains a ToD, ToA, or PS-TOA timestamp, in units of pico-seconds.

The ToD timestamp 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 timestamp 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 PS-ToA timestamp 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, in a phase shift ToA sense. The phase shift ToA is defined as the average linear phase shift between two adjacent tones normalized by the tone spacing. An example of calculation of the phase shift is shown in 6 Annex Z.

…

***TGaz Editor: Change the text in Subclause 9.4.2.286 (RSTA Passive Location LMR element) on P84L17 as follows:***

**9.4.2.286 RSTA Passive TB Ranging Measurement Report element *(#2340)***

…

The Dialog Token field shall be copied from the Sounding Dialog Token field in the Ranging

NDP Announcement frame of the corresponding to the measurement sounding phase in which

the reported RSTA’s timestamps were measured (see 11.22.6.4.3 (TB ranging measurement exchange) and 11.22.6.4.8 (Measurement exchange in passive ranging mode)).

The N Time Stamp Measurement Reports field is an unsigned integer indicating the number of Timestamp Measurement Reports. The value 0 of the N Timestamp Measurement Reports field is reserved.

Timestamp Measurement Reports field contains one or more Timestamp Measurement Report fields defined as in Figure 9-1024 (Time Stamp Measurement Report subfield) with definitions as detailed in subclause 9.4.2.285 (ISTA Passive Location Measurement Report element). **(#1519)**

…

***TGaz Editor: Change the text in Subclause 9.4.2.287 (Passive Location LCI Table element) P86L6 as follows:***

**9.4.2.287 Passive Location LCI Table element**

…

The ISTA LCI Report subfield is present if the RSTA has never transmitted it before or its content has changed and it is periodically present otherwise. If present, it contains a Measurement Report element with Measurement Type field equal to LCI (see Table 9-118 (Measurement Type field definitions for measurement reports)), which either indicates the LCI of the ISTA and may include the Z subelement Usage Rules/Policy subelement, Antenna Placement and Calibration subelement, or indicates an unknown LCI (see 11.22.6.7 (LCI and Location Civic retrieval using FTM procedure)). (#**2302**)

…

**References:**

**[1] Draft P802.11az\_D1.5**