IEEE P802.11
Wireless LANs

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| LB253 Phase shift TOA feedback CR |
| Date: 2021-07-13 |
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Abstract

We are here proposing a resolution to LB253 CID 5231 that enables an ISTA to report PSTOA and still be able to measure its RTT without itself having to measure its TOA. The ISTA would in this case rely on the RSTA to report both its TOA and PSTOA. For this purpose we are adding an optional element in the LMR frame that carriers a PSTOA and a PSTOA error field.

In addition we are here enabling an RSTA to report PSTOA and still be able to measure RTT without itself having to measure its TOA. The RSTA would in this case rely on the ISTA to report both its TOA and PSTOA.

We are also here cleaning up the logic in the negotiation of phase shift TOA feedback.

The TGaz LB253 CID addressed in this document is CID 5231.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 5231 | 130.13 | 11.21.6.3.3 | It is not specified how phase shift feedback reporting works if the ISTA is reporting phase shift TOAs in non-TB and TB ranging. How will the ISTA get the required information from the RSTA in order to compute the RTT? | Add specification and description for the case when the ISTA is reporting phase shift TOAs in non-TB and TB ranging and how the ISTA will get the required information from the RSTA in order to compute the RTT. | Revised. TGaz editor, make the changes as shown in document https://mentor.ieee.org/802.11/dcn/20/11-21-1108-00-00az-lb253-phase-shift-toa-feedback-cr.docx. |

***TGaz Editor: Change the text in Subclause 9.4.2.298 (Ranging Parameters element) as follows:***

**9.4.2.298 Ranging Parameters element**

… <Scroll to P74L21>

(#**5088**, #**5454**, #**5193**, #**5175**)The R2I TOA Type subfield is set to 1 in the IFTMR frame to indicate that the ISTA supports TOA feedback type in the R2I LMR to phase shift which corresponds to the average linear phase across the subcarriers. Otherwise, the R2I TOA Type subfield is set to 0. The R2I TOA Type subfield is set to 1 in the initial Fine Timing Measurement frame to indicate that the RSTA estimates TOA using phase shift; and set to 0 to indicate that the RSTA estimates TOA using first path reporting. (#**1648**)

The I2R TOA Type subfield in the IFTMR frame is set to 1 to request(#**5231**) the ISTA reports (#**5231**) phase shift type TOA feedback and is set to 0 to request reporting of (#**5231**) first path reporting in the I2R LMR. The I2R TOA type subfield in the initial Fine Timing Measurement frame is set to 1 to indicate that the TOA feedback type in the I2R LMR to be phase shift type of TOA, corresponding to the average linear phase across the subcarriers and is set to 0 to indicate that the feedback type in the I2R will be of the first path reporting.

***TGaz Editor: Insert the subclause below after Subclause 9.4.2.307 (LOS Likelihood element) as follows:***

**9.4.2.308 Phase Shift TOA And Error Timestamp element**

The Phase Shift TOA And Error Timestamp element is used to signal phase shift TOA timestamps and their errors in the Location Measurement Report frame. The format of the Phase Shift TOA And Error Timestamp element is shown in Figure 9-788ed6 (Phase Shift TOA And Error Timestamp element).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Element Id | Element Length | Element ID Extension | PSTOA | PSTOAError |
| Octets: | 1 | 1 | 1 | 6 | 1 |

**Figure 9-788ed6—** **Phase Shift TOA And Error Timestamp element Action field format (#5231)**

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

The PSTOA field contains a phase shift TOA timestamp. See appendix AD.1 Phase Shift Feedback Calculation for how to calculate a phase shift TOA timestamp.

The PSTOA Error field contains an error field for the phase shift TOA timestamp reported in the PSTOA field, formatted and defined the same way as a TOA Error field described in Figure 9-909ac (Format of the TOA Error field).

***TGaz Editor: Change the text in Subclause 9.6.7.49 (Location Measurement Report frame format) as follows:***

**9.4.6.49 Location Measurement Report frame format**

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The TOA field contains a timestamp calculated based on the first arrival path of the channel impulse response (#**5231**) that represents the time, with respect to a time base, at which the start of the preamble of the corresponding NDP (#**2274**) arrived at the receive antenna connector. The corresponding NDP in an R2I LMR frame is an I2R NDP, while in an I2R LMR frame it is a R2I NDP. In both cases the corresponding NDP refers to a measurement exchange that included an Ranging NDP Announcement frame which carried the matching dialog token that is also included in this LMR. (#**1967**)

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CFO Parameter | R2I NDP Tx Power | I2R NDP Target RSSI |  Secure LTF Parameters (optional) | AOA Feedback (optional) | Phase Shift TOA And Error Timestamp(optional) |
| Octets: | 2 | 1 | 1 | 13 | 9 | 6 |

**Figure 9-909aa—Location Measurement Report frame (#1856) Action field format (#TC1208r1, #3883)** (#**5231**)

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B4 | B5 | B6 | B7 |
|  | Max TOA Error Exponent | Reserved | Invalid Measurement | Reserved |
| Bits: | 5 | 1 | 1 | 1 |

**Figure 9-909ac—Format of the TOA Error field** (#**5231**)

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<Scroll to P102L30>

The AOA Feedback field is optionally present. If present, it contains a Direction Measurement Results element; see 9.4.2.300 (Direction Measurement Results element).

If phase shift feedback is negotiated, the Phase Shift TOA And Error Timestamp field contains a Phase Shift TOA And Error Timestamp element that containts the phase shift TOA timestamp and error for the corresponding NDP. The phase shift TOA timestamp is always associated with NDP transmitted in the current measurement exchange. (#**5231**)

***TGaz Editor: Change the text in Subclause 11.21.6.1.2 (Non-TB Ranging overview) as follows:***

**11.21.6.1.2 Non-TB Ranging overview**

… <Scroll to P120L14>

NOTE—Below are a list of example exceptions for Passive TB Ranging where it does not follow the rules for TB Ranging: (#**3547**, #**3548**, #**3791**)

* The rules and procedures specific for the secure version of TB Ranging does not apply to Passive TB Ranging.
* The RSTA uses the Ranging Trigger frame of subtype Passive TB Ranging for its sounding trigger frames.
* The ISTAs use HE Ranging NDPs for its I2R NDPs.
* The ISTAs does not use the Location Measurement Report frame for reporting of I2R LMR but instead uses the ISTA Passive TB Ranging Measurement Report frame for this purpose, with its associated different measurements.
* The RSTA send the Primary and Secondary RSTA Broadcast Passive TB Ranging Measurement Report frames at the end of the measurementexchange. (#**3544**)
* The number of spatial streams (NSTS) for Passive TB Ranging is limited to 4.
* When phase shift feedback is negotiated for Passive TB Ranging, both the RSTA and the ISTA measures and reports PSTOAs, in addition to measuring and reporting TOAs.

***TGaz Editor: Change the text in Subclause 11.21.6.3.3 (Negotiation for TB and Non-TB Ranging measurement exchange) as follows:***

**11.21.6.3.3 Negotiation for TB and Non-TB Ranging measurement exchange**

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An ISTA and an RSTA may negotiate a phase shift feedback mode of the Non-TB Ranging and TB Ranging measurement exchange (11.21.6.4.3), for either the R2I LMR and/or I2R LMR.

If phase shift feedback is negotiated for the R2I LMR, then the RSTA shall report its phase shift TOA timestamp in the PSTOA field in the R2I LMR frame, and the shall report the TOA timestamp as an invalid measurement. (#**5231**)

If phase shift feedback is negotiated for the R2I LMR, and I2R LMR is negotiated, then the ISTA shall, in addition to reporting its TOA timestamp and error, also report its phase shift TOA timestamp and error in the Phase Shift TOA And Error element in the R2I LMR frame. (#**5231**)

If phase shift feedback is negotiated for the I2R LMR, then the ISTA shall report its phase shift TOA timestamp in the PSTOA field in the I2R LMR frame, and shall report the TOA timestamp as an invalid measurement. (#**5231**)

If phase shift feedback is negotiated for the I2R LMR, then the RSTA shall, in addition to reporting its TOA timestamp and error, also report its phase shift TOA timestamp in the PSTOA field and its error in the Phase Shift TOA And Error element in the I2R LMR frame. (#**5231**)

The phase shift TOA timestamps shall always be referring to timestamps corresponding to the NDPs transmitted in the current measurement exchange, i.e. shall not be using delayed reporting. (#**5231**)

The TOA timestamp may, as negotiated, be using immediate or delayed reporting. (#**5231**)

NOTE—tp2 and tp4 are reported in the same units of time (not angle) as the TOA; see 9.6.7.48 34 (Location Measurement Report frame format). (#**3605**)

An RSTA in which dot11PhaseShiftFeedbackImplemented is true shall set the Phase Shift Feedback Support field in the Extended Capabilities element to 1 to indicate RSTA’s capability. If an RSTA has set the Phase Shift Feedback Support field to 1 in the Extended Capabilities element, then to request the phase shift feedback mode for the R2I LMR, an ISTA shall set the R2I TOA Type subfield in the Ranging Parameter field in an IFTMR frame to 1. To assign phase shift feedback in the R2I LMR the RSTA shall set the R2I TOA subfield in the Ranging Parameter field in an initial Fine Timing Measurement frame to 1 (#**3607**), otherwise it shall set it to 0. If the RSTA sets the R2I TOA Type subfield in the Ranging Parameter field in an initial Fine Timing Measurement frame to 1, the RSTA shall carry the phase shift tp2 of I2R NDP in the R2I LMR. (#**1581**, #**3606**)

An ISTA that has set the I2R LMR feedback subfield in the Ranging Parameters field in an initial Fine Timing Measurement Request frame to 1, shall set the I2R TOA Type subfield in the same field to 1 in order to request the phase shift feedback mode in the I2R LMR. To assign phase shift feedback mode in the I2R LMR, the RSTA shall set the I2R TOA Type subfield in the Ranging parameters field of an initial Fine Timing Measurement frame to 1, otherwise it shall set it to 0. If the RSTA sets the I2R TOA Type subfield in the Ranging parameters field of an initial Fine Timing Measurement frame to 1, the ISTA shall carry the phase shift tp4 of R2I NDP in the I2R LMR. (#**1581**, **3616**)

***TGaz Editor: Change the text in Subclause 11.21.6.4.3.4 (Reporting phase of TB Ranging measurement) as follows:***

**11.21.6.4.3.4 Reporting phase of TB Ranging measurement**

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In TB ranging measurement reporting, any phase shift timestamps that are reported shall be reported immediately, i.e. not delayed. Any TOA timestamps that are reported shall be reported immediate or delayed as negotiated. (#**5231**)

***TGaz Editor: Change the text in Subclause 11.21.6.4.4.3 (Non-TB Ranging Measurement Reporting phase) as follows:***

**11.21.6.4.4.3 Non-TB Ranging Measurement Reporting phase**

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In Non-TB Ranging measurement reporting phase, any phase shift timestamps that are reported shall be reported immediately, i.e. not delayed. Any TOA timestamps that are reported shall be reported immediate or delayed as negotiated. (#**5231**)

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**References:**

**[1] Draft P802.11az\_D3.1**