IEEE P802.11
Wireless LANs

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| LB286 Comment Resolution Section 11 Part 2 |
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Abstract

This submission proposes to address the following CID 2068, 2101, 2103, and 2104 changes are relative to Draft P802.11be\_D5.1, Draft P802.11REVme\_D5.0, and Draft P802.11bk D2.0.

Revisions:

1. Removed CIDs 2051, 2134 and 2106, some updates during presentation

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGbk Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbk Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGbk Editor: Editing instructions preceded by “TGbk Editor” are instructions to the TGbk editor to modify existing material in the TGbk draft. As a result of adopting the changes, the TGbk editor will execute the instructions rather than copy them to the TGbk Draft.***

**The text preceded by “Discussion” is not part of the adopted changes.**

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| **2068** | 78.16 | 11.21.6.4.8.3 | "TF Passive TB Ranging Sounding" -- no such frame (2x) | As it says in the comment | **Revised**TGbk editor: Update Figure 11-68 frame names. |
| **2101** | 78.01 | 11.21.6.4.8.3 | "Otherwise, the RSTA shall set the associated TXVECTOR parameter CH\_BANDWIDTH of the Passive Sounding Ranging Trigger frame to CBW320. " -- TXVECTORs are associated with PSDUs, not MPDUs | As it says in the comment | **Revised**TGbk editor see changes in document<https://mentor.ieee.org/802.11/dcn/24/11-24-0846-01-00bk-lb286-comment-resolution-section-11-part-2.docx> |
| **2103** | 79.06 | 11.21.6.4.8.3 | "An RSTA receiving an HE Ranging NDP or an EHT Ranging NDP solicited by a Passive Sounding Ranging Trigger frame, shall set the TXVECTOR parameter CH\_BANDWIDTH to be the same value as the UL BW subfield of the Common Info field in the Passive Sounding Ranging Trigger frame transmitted at bandwidth less than or equal to 160 MHz, to initiate a transmission of aRanging NDP Announcement frame and an HE/EHT Ranging NDP. In the case the bandwidth of the soliciting Passive Sounding Ranging Trigger frame is equal to 320 MHz, the RSTA shall set the TXVECTOR parameter CH\_BANDWIDTH to CBW320." is still worded very oddly" | "Change to""A RSTA receiving an HE Ranging NDP or an EHT Ranging NDP solicited by a Passive Sounding Ranging Trigger frame transmitted at a bandwidth less than 320 MHz shall set the TXVECTOR parameter CH\_BANDWIDTH to be the same value as the UL BW subfield of the Common Info field in the Passive Sounding Ranging Trigger frame, to initiate a transmission of aRanging NDP Announcement frame and an HE/EHT Ranging NDP. If the bandwidth of the soliciting Passive Sounding Ranging Trigger frame is equal to 320 MHz, the RSTA shall set the TXVECTOR parameter CH\_BANDWIDTH to CBW320.""(the bit after the comma is still garbled, which is the subject of another comment)" | **Revised**TGbk editor see changes in document<https://mentor.ieee.org/802.11/dcn/24/11-24-0846-01-00bk-lb286-comment-resolution-section-11-part-2.docx> |
| **2104** | 79.06 | 11.21.6.4.8.3 | "An RSTA receiving an HE Ranging NDP or an EHT Ranging NDP solicited by a Passive Sounding Ranging Trigger frame, shall set the TXVECTOR parameter CH\_BANDWIDTH to be the same value as the UL BW subfield of the Common Info field in the Passive Sounding Ranging Trigger frame transmitted at bandwidth less than or equal to 160 MHz, to initiate a transmission of aRanging NDP Announcement frame and an HE/EHT Ranging NDP." -- the bit after the second comma ("to initiate") is very unclear | I assume it's referring to the TXVECTOR used for those two transmissions, so change to "... when transmitting the Ranging NDP Announcement frame and HE/EHT Ranging NDP." | **Revised**TGbk editor see changes in document<https://mentor.ieee.org/802.11/dcn/24/11-24-0846-01-00bk-lb286-comment-resolution-section-11-part-2.docx> |
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**11.21.6.4.8 Measurement exchange in passive TB ranging mode**

1. ***TGbk Editor: Change Clause 11.21.6.4.8 Measurement exchange in passive TB ranging mode (starting on page 77) as follows:***

**11.21.6.4.8.1 General**

***Change Subclause 11.21.6.4.8.1 as follows:***

As stated in [11.21.6.1.3](#H11o21o6o1o3) (Passive TB ranging), the passive TB ranging mode is a variant of the TB ranging mode. In all aspects, except where explicitly stated differently, the passive TB ranging mode, its protocols, procedures, components, and definitions follow the rules for TB ranging mode.

In particular the measurement exchanges for passive TB ranging follows the rules and procedures described in [11.21.6.4.3](#H11o21o6o4o3) (TB ranging measurement exchange), with subclauses, unless explicitly stated otherwise.

In passive TB ranging, the RSTA shall transmit the Passive Sounding Ranging Trigger frame instead of the Sounding Ranging Trigger frame. Upon receiving of the Passive Sounding Ranging Trigger frame, the ISTA shall respond with an HE Ranging NDP instead of an HE TB Ranging NDP (or respectively an EHT Ranging NDP instead of an EHT TB Ranging NDP); see [11.21.6.4.8.3](#H11o21o6o4o8o3) (Passive TB ranging measurement sounding phase) for further details.

Furthermore, the RSTA shall broadcast two frames, the Primary and Secondary RSTA Broadcast Passive TB Ranging Measurement Report frames containing measurement data and related information; see [11.21.6.4.8.4](#H11o21o6o4o8o4) (Passive TB ranging measurement reporting phase) for further details.

The passive TB ranging exchanges shall only occur in an availability window assigned for Passive TB ranging.

For passive TB ranging, the timestamps reported within each availability window shall be derived from a clock that runs continuously during the availability window.

If there is a discontinuity in the clock for the FTM timestamping between two reported TOD timestamps, then the TOD Not Continuous subfield in the Timestamp Error subfield of the Timestamp Measurement Report subfield in the ISTA Passive TB Ranging Measurement Report element shall be set to 1. Otherwise it shall be set to 0.

**11.21.6.4.8.2 Polling Phase of passive TB ranging**

The Polling phase of passive TB ranging follows the same rules and procedures for the Polling phase of TB ranging described in Subclause [11.21.6.4.3.2](#H11o21o6o4o3o2) (Polling Phase of TB ranging).

**11.21.6.4.8.3 Passive TB ranging measurement sounding phase**

***Change Subclause 11.21.6.4.8.3 as follows:***

The passive TB ranging measurement sounding follows the same rules and procedures for the measurement sounding for TB ranging described in [11.21.6.4.3.3](#H11o21o6o4o3o3) (TB ranging Measurement Sounding phase), unless explicitly stated otherwise.

The second phase of the passive TB ranging measurement sequence, after the passive TB ranging Polling phase, is called the passive TB ranging measurement sounding phase. The passive TB ranging measurement sounding phase may include one or more Passive Sounding Ranging Trigger frames and ~~HE Ranging~~I2R NDP exchanges, a Ranging NDP Announcement frame, and an ~~HE Ranging~~R2I NDP transmission; see Figure [11-68](#F11o68) (Passive TB ranging polling, Measurement Sounding, and Measurement Reporting phases).



1. Figure 11-68—Passive TB ranging polling, measurement sounding, and measurement reporting phases.

In passive TB ranging, for each ISTA, the RSTA shall transmit a Passive Sounding Ranging Trigger frame, which includes a single User Info field which is not a Special User Info field.

An RSTA shall transmit one or more Passive Sounding 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 AID/RSID in the Passive Sounding Ranging Trigger frame shall transmit an ~~HE Ranging~~I2R NDP a SIFS ~~time~~ after the reception of the Passive TB Ranging Ranging Trigger frame.

An RSTA transmitting a Passive Sounding Ranging Trigger frame shall not use a sounding bandwidth wider than that indicated in the IFTM frame sent to the ISTA, and the RSTA shall set the associated (#**1288**) TXVECTOR parameter CH\_BANDWIDTH or CH\_BANDWIDTH\_IN\_NON\_HT to ~~be~~ the ~~same~~ sounding bandwidth ~~value as the UL BW subfield of the Common Info field in the Passive Sounding Ranging Trigger frame~~.

NOTE—Generally a PSTA benefits from consistent ranging measurement performance when an RSTA initiates a passive TB ranging sequence with the nominal advertised bandwidth in every TXOP.

(#**2103**) An RSTA transmitting a Ranging NDP Announcement frame and an ~~HE Ranging~~ R2I NDP after receiving an ~~HE Ranging~~I2R NDP as a response to a Passive Sounding Ranging Trigger frame, shall set the TXVECTOR parameter CH\_BANDWIDTH or CH\_BANDWIDTH\_IN\_NON\_HT to ~~be~~ the ~~same~~ sounding bandwidth ~~value as the BW subfield of the Common Info field in the Passive Sounding Ranging Trigger frame~~.

An ISTA transmitting an ~~HE Ranging~~I2R NDP as a response to a Passive Sounding Ranging Trigger frame shall set the TXVECTOR parameter CH\_BANDWIDTH ~~to be~~ in the same ~~value~~ way as when sending an HE TB Ranging NDP or EHT TB Ranging NDP in response to the Trigger frame respectively, ~~the UL BW subfield of~~ i.e., based on the Common Info field and User Info field in the Passive Sounding Ranging Trigger frame.

As in TB ranging, an ISTA participating in a passive TB ranging exchange shall measure the TOD of its own ~~HE Ranging~~I2R NDP and either the TOAs, or both the TOAs and the phase shift feedback TOAs (PSTOAs), when it receives the RSTA’s ~~HE Ranging~~R2I NDP. In addition, optionally the ISTA may also measure and report either the TOAs, or both the TOAs and the PSTOAs, when it receives the ~~HE Ranging~~I2R NDPs transmitted by the other ISTAs participating in the passive TB 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 TB ranging exchanges can be improved.

The number of NSTS/NSS used in the passive TB ranging exchanges shall be less than or equal to 4.

When phase shift feedback is negotiated between an ISTA and an RSTA in passive TB ranging, the protocol for the measurement sounding phase differs from passive TB ranging with TOA feedback on the following points:

* TA.
* The ISTA shall measure:

	+ the phase shift TOA (PSTOA), in addition to measuring the TOA, for the R2I NDP it receives from the RSTA.
	+ and may also measure phase shift TOA(s) (PSTOAs), in addition to measuring the TOA(s), for the I2R NDP(s) it receives from other ISTA(s).

See Figure [11-69](#F11o69) (Example Timing diagram of a Measurement Sounding phase in passive TB ranging) for an example of timestamps 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 corresponding labeled timestamps in [11.21.6.4.3.3](#H11o21o6o4o3o3) (Measurement Sounding phase of TB ranging). The timestamps t5 and t6 are the times at which the I2R NDP and R2I NDPs arrive at the PSTA, respectively.



1. Figure 11-69—Example timing diagram of a measurement sounding phase in passive TB ranging

The PSTA may use the ISTA’s and RSTA’s timestamps, 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 (DToF) from PSTA to RSTA and ISTA (DToF\_PRI) is defined by Equation ([11-11](#E11o11)).

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

~~W~~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 ~~per~~ defined in Equation ([11-12](#E11o12)).

DToF\_PRI = t6 – t5 – 0.5 × t3’ + 0.5 × t2’ – 0.5 × t4’ + 0.5 × t1’, (11-12)

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.

See 11.21.6.4.9 (Passive TB ranging differential time-of-flight calculations using phase shift TOA timestamps) for how the PSTA’s differential distance to the RSTA and the ISTA can be computed using PSTOAs measured by the RSTA and the ISTA.

**11.21.6.4.8.4 Passive TB ranging measurement reporting phase**

The passive TB ranging measurement reporting follows the same rules and procedures for the measurement reporting for TB ranging described in [11.21.6.4.3.4](#H11o21o6o4o3o4) (TB ranging Measurement Sounding phase), unless explicitly stated otherwise.



1. Figure 11-70—Passive TB ranging measurement reporting phase

The last phase of the passive TB ranging measurement sequence is the passive TB ranging measurement reporting phase and occurs a SIFS ~~time~~ after the passive TB ranging measurement sounding phase; see Figure [11-70](#F11o70) (Passive TB ranging measurement reporting phase) for a depiction of the passive TB ranging measurement reporting phase.

In the passive TB ranging measurement reporting phase, an RSTA shall send a Passive TB Ranging Measurement Report frame and the Report Ranging Trigger frame to one or more ISTAs that sent an ~~HE Ranging~~I2R NDP in the preceding passive TB ranging measurement sounding phase. An ISTA addressed by the Report Ranging Trigger frame shall transmit an ISTA Passive TB Ranging Measurement Report frame a SIFS ~~time~~ after the Report Ranging Trigger frame transmission to report its I2R LMR.

In order to facilitate broadcasting of the ISTA’s timestamps by the RSTA the ISTA Passive TB Ranging Measurement Report frame shall be transmitted as a public Action frame.

The ISTA Passive TB Ranging Measurement Report element, see 9.4.2.307 (ISTA Passive TB Ranging Measurement Report element), in ISTA Passive TB Ranging Measurement Report frames shall contain:

* a Sounding Dialog Token Number identifying the measurement sounding phase in which the reported ISTA’s timestamps were measured.
* the CFO of the ISTA with respect to the RSTA.
* the TOD timestamp for the I2R NDP that the ISTA transmitted – labeled with the AID12/RSID12 of the ISTA.
* the TOA timestamp for the R2I NDP that the ISTA received from the RSTA.
* optionally, the TOA timestamps for the I2R NDPs received from other ISTAs participating in the passive TB ranging (i.e., polling, sounding and reporting triplet) identified by the Sounding Dialog Token Number – labeled with their respective AID12/RSID12s.

If phase shift TOA reporting has been negotiated, the ISTA Passive TB Ranging Measurement Report element shall also include:

* the PS-TOA timestamp of the R2I NDP that the ISTA received from the RSTA; and
* optionally, the PS-TOAs for the I2R NDPs received from other ISTAs participating in the passive TB ranging (i.e., polling, sounding, and reporting triplet) identified by the Sounding Dialog Token Number– labeled with their respective AID12/RSID12s.

The ISTA Passive TB Ranging Measurement Report frame shal’ include an entry for the ISTA's I2R NDP TOD.

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 Primary and Secondary RSTA Broadcast Passive TB Ranging Measurement Report frames, the Primary a SIFS ~~time~~ after receiving the ISTA Passive TB Ranging Measurement Report frames from the ISTA and the Secondary a SIFS following the Primary; see Figure [11-70](#F11o70) (Passive TB ranging measurement reporting phase).

The Primary RSTA Broadcast Passive TB Ranging Measurement Report frame shall contain the following:

* Passive TB Ranging LCI Table Counter.
* Passive TB Ranging LCI Table Countdown Info.
* RSTA Passive TB Ranging Measurement Report.
* Passive TB Ranging LCI Table (optionally present).

Each time an RSTA transmits a Primary RSTA Broadcast Passive TB Ranging Measurement Report frame, it shall set the Passive TB Ranging LCI Table Counter value such as to refer to the latest version of the Passive TB Ranging LCI Table element transmitted by the RSTA.

If a Passive TB Ranging LCI Table element is included in the Primary RSTA Broadcast Passive TB Ranging Measurement Report frame, and this element has different content as compared to the last transmitted Passive TB Ranging LCI Table element, then Passive TB Ranging LCI Table Counter shall be incremented by 1 (modulo 256) from the value associated with the previous Passive TB Ranging LCI Table element content. (The first time the RSTA transmits a Passive TB Ranging LCI Table element the value shall be set to 0). This new value of the Passive TB Ranging LCI Table Counter is now associated with this new version of the Passive TB Ranging LCI Table element.

If a Passive TB Ranging LCI Table element is included in the Primary RSTA Broadcast Passive TB Ranging Measurement Report frame, and this element has the same content as the last transmitted Passive TB Ranging LCI Table element, then Passive TB Ranging LCI Table Counter value shall be the value associated with this last version of the Passive TB Ranging LCI Table element transmitted by the RSTA.

If a Passive TB Ranging LCI Table element is not included in the Primary RSTA Broadcast Passive TB Ranging Measurement Report frame, then the Passive TB Ranging LCI Table Counter value shall be the value associated with the last version of the Passive TB Ranging LCI Table element transmitted by the RSTA.

When the Passive TB Ranging LCI Table is present in the Primary Broadcast Passive TB Ranging Measurement Report frame, the RSTA LCI Report field of the Passive TB Ranging LCI Table Report element shall contain the Antenna Placement and Calibration subelement if the RSTA has dot11PassiveTBRangingAODImplemented equal to true, and shall not contain the Antenna Placement and Calibration subelement if the RSTA has dot11PassiveTBRangingAODImplemented equal to false.

When the Passive TB Ranging LCI Table is present in the Primary Broadcast Passive TB Ranging Measurement Report frame, the corresponding entree of the ISTA LCI Reports Entries field of the Passive TB Ranging LCI Table Report element shall contain the Antenna Placement and Calibration subelement if the ISTA has dot11PassiveTBRangingAoDImplemented equal to true, and shall not contain the Antenna Placement and Calibration subelement if the ISTA has dot11PassiveTBRangingAODImplemented equal to false.

The Secondary RSTA Broadcast Passive TB Ranging Measurement Report frame shall contain the following:

* ISTA Passive TB Ranging Measurement Reports: see 9.6.7.52 (Secondary RSTA Broadcast Passive TB Ranging Measurement Report frame format).

When phase shift feedback is negotiated between an ISTA and an RSTA in Passive TB ranging, the protocol for the measurement reporting phase differs from Passive TB ranging with TOA feedback on the following points:

* The RSTA shall report its measured PSTOA in the R2I LMR frame.
* The ISTA shall report its measured PSTOA(s), in addition to its measured TOA(s), in the ISTA Passive TB Ranging Measurement Report frame.
	+ The PSTOAs are indicated as phase shift TOA timestamps by setting the Measurement Report field of the ISTA Passive TB Ranging Measurement Report element, see 9.4.2.307 (ISTA Passive TB Ranging Measurement Report element), to the value 10 (PSTOA).
* In the Primary RSTA Broadcast Passive TB Ranging Measurement Report frame, the RSTA shall send a broadcast frame containing its measured PSTOA, in addition to its measured TOA, for the I2R NDPs it has received from the ISTA.
* In the Secondary RSTA Broadcast Passive TB Ranging Measurement Report frame the RSTA shall rebroadcast the timestamps the ISTA has reported to the RSTA. As the ISTA has negotiated phase shift feedback, these would contain PSTOAs in addition to TOAs.

When phase shift feedback is negotiated in Passive TB ranging, the reporting by both the RSTA and the ISTA of phase shift TOAs, the TOD, and CFO shall be immediate feedback. The reported TOAs may be immediate or delayed feedback. When the TOA feedback is delayed, the dialog token shall refer to the previous measurement instance for the RSTA-ISTA pair.

The TODs and PSTOAs measured by the RSTA shall be broadcast in the Primary RSTA Broadcast Passive TB Ranging Measurement Report frame in the reporting phase following the measurement exchange in which they were measured.

The CFO, TOD, and PSTOAs reported by the ISTA shall be rebroadcasted in the Secondary RSTA Broadcast Passive TB Ranging Measurement Report frame in the reporting phase following the measurement exchange in which they were measured.